

YAMAHA CONDENSED CATALOG



YAMAHA

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YAMAHA INTEGRATION

Seeking the best in sound reproduction, Yamaha has captured sound as digital information and created its own sound-oriented semiconductor technology.

By combining its experience in building electronic musical instruments with high-tech R & D work, Yamaha has mastered the art of making sophisticated LSI chips for graphics processing, communications, and fullcustom and semicustom applications.

Milestones in Yamaha LSI Technology



The Yamaha plant at Toyooka, Japan, produces Electone digital keyboard instruments, wind instruments, and LSI circuits. This plant contains our primary LSI Research and Development Lab.



The Yamaha plant in Kagoshima, Japan — known as the Yamaha Kagoshima Semiconductor Company — produces LSI circuits.

1969	●IC manufacturing project initiated.
1970	●Construction of first IC manufacturing plant, at Toyooka, Japan, started. ●IC production started.
1976	●Construction of second IC manufacturing plant, at Kagoshima, Japan, completed. ●Development of FM sound generators initiated.
1978	●Dry etcher added to production equipment. ●Projection aligner—device that aligns the mask, via projection, to allow more dice per water to be obtained—added to production equipment.
1980	●VLSI circuit production initiated. ●Automatic layout program developed. ●Manufacturing process simulator developed.
1983	●Marketing of semiconductor products started—devices marketed include LSI circuits for advanced high-density discs, compact discs, FM musical sound generation, digital-to-analog conversion, and pressure sensors for printing press control. ●Automatic LSI design system developed—performs mask-pattern generation; device layout, and standard-cell routing.
1984	●Marketing of custom LSI circuits initiated.
1987	●Production facility at Kagoshima incorporated as Yamaha Kagoshima Semiconductor Company. ●Yamaha Corporation of America established Systems Technology Division to market components, boards and system in The United States.
1988	●Class 1 clean room completed ●YST moved to San Jose, California ●Operation of 1.2 μ rule CMOS production line started ●Marketing of LSI for teletext broadcasting started ●Marketing of LSI for CDI started
1989	●Marketing of 2M, 4M bit high-speed ROM started ●Marketing of LSI for 9600bps FAX modem started ●Marketing of LSI set for LV player started ●Marketing of LSI for ISDN started ●Marketing of Dolby Pro Logic decoder started
1990	●Operation of 0.8 μ rule CMOS production line started ●Marketing of karaoke surround processor started ●High speed SRAM introduced ●Marketing of facsimile controller started
1991	●Marketing of CD Graphics decoder started. ●Marketing of sound chip set for Multimedia Personal Computer(MPC) started.
1992	●Marketing of video signal processor for Laser Disc started. ●Marketing of application specific video display processor started.
1993	●Operation of 0.65 μ rule CMOS production line started ●Marketing of low-voltage driven faxmodem started
1994	●Marketing of low-voltage driven multimedia PC sound generator started
1995	●Marketing of Rendering Polygon Accelerater started

Precautions on the surface-mount plastic package handling

The epoxy resin used for plastic package can absorb moisture from the atmosphere. This moisture is evaporated rapidly during soldering. It causes the deterioration of package integrity or cracks in the resin.

Please comply with the following precautions regarding product storage and soldering the products onto the printed board.

1. Storage condition and storage term before soldering

Please store the products in antistatic environment which is as dry as possible to prevent moisture absorption, until soldering. In case of long-term storage in dry packing, we recommend storage in a dry box or in a desiccator. If this is not possible, please store them under the following conditions:

table 1. Standard storage condition and storage term of surface mount plastic package (plastic SOP, QFP, SQFP, TQFP and PLCC)

	storage condition		storage term
not dry packing products	—		5 ~ 30℃, under 70%RH
dry packing products	before opening dry pack		under 35℃
	after opening dry pack	TQFP	5 ~ 30℃, under 70%RH
		SQFP48, SQFP100	5 ~ 30℃, under 70%RH
		SOP40, SQFP64 SOP embossing-tape packing product	5 ~ 30℃, under 70%RH
		SOP16/20/24/28, SQFP144, SQFP176	5 ~ 30℃, under 70%RH
		QFP44/64/80/100/128/144/160/208/240 PLCC	5 ~ 30℃, under 70%RH

- If stored again after opening dry pack, please put in the products with silica gel and seal up hermetically, then store under condition described above or in a dry box.
- The storage term described above can vary due to the chip size about individual package type. Please inquire us about details for each products.
- * Drying treatment(pre-baking) is necessary before soldering.

2. Drying (dehumidification) before soldering

In the event of one of the followings, drying (pre-baking) is necessary before soldering.

- a. The indication color of the desiccant has changed to pink.
- b. The specified period described above(table 1) is expired after opening.

The normal shipping trays and sleeves are not heatproof and can't be pre-baked. So please transfer the products to heatproof trays or sleeves before pre-baking.

Pre-baking condition would be for 16 to 24 hours at 125℃.

Solder condition of surface mount plastic package

1. Wave soldering

The surface mount package is basically not suitable for wave soldering. (dipping)
However for the SOP16 package, wave soldering can be applicable or not according to circumstances such as package materials, chip size, packing and storage conditions.

2. Infrared reflow

We would recommend to heat from above and below to prevent spot heating.
The surface temperature of the package and printed board should be at most 235°C for less than 10 seconds.
Please refer to Figure.1 for an example of the recommended temperature profile.

3. Vapor phase reflow

The atmospheric temperature should be at most 215°C within 30 seconds.
Please refer to Figure. 2 for an example of recommended temperature profile.

Figure 1. Infrared reflow recommended temperature profile

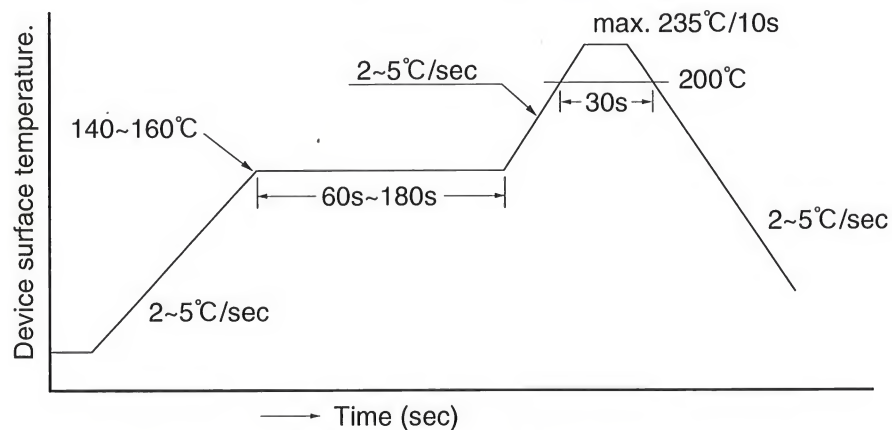
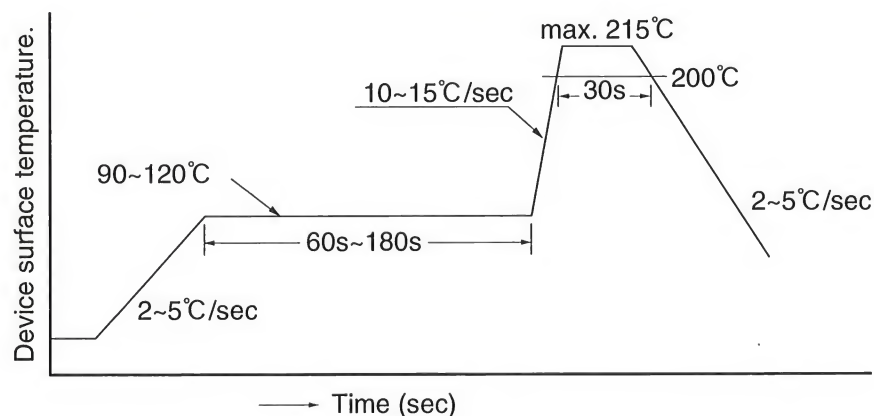


Figure 2. Vapor phase reflow recommended temperature profile



Please confirm the handling requirements of each product separately before using the product.

SOUND GENERATOR

YMF704B *OPL*TM

OPL4-ML (FM + Wave table Synthesizer)

■ APPLICATION EXAMPLES

Multimedia PC, Sound board for PC, PC card

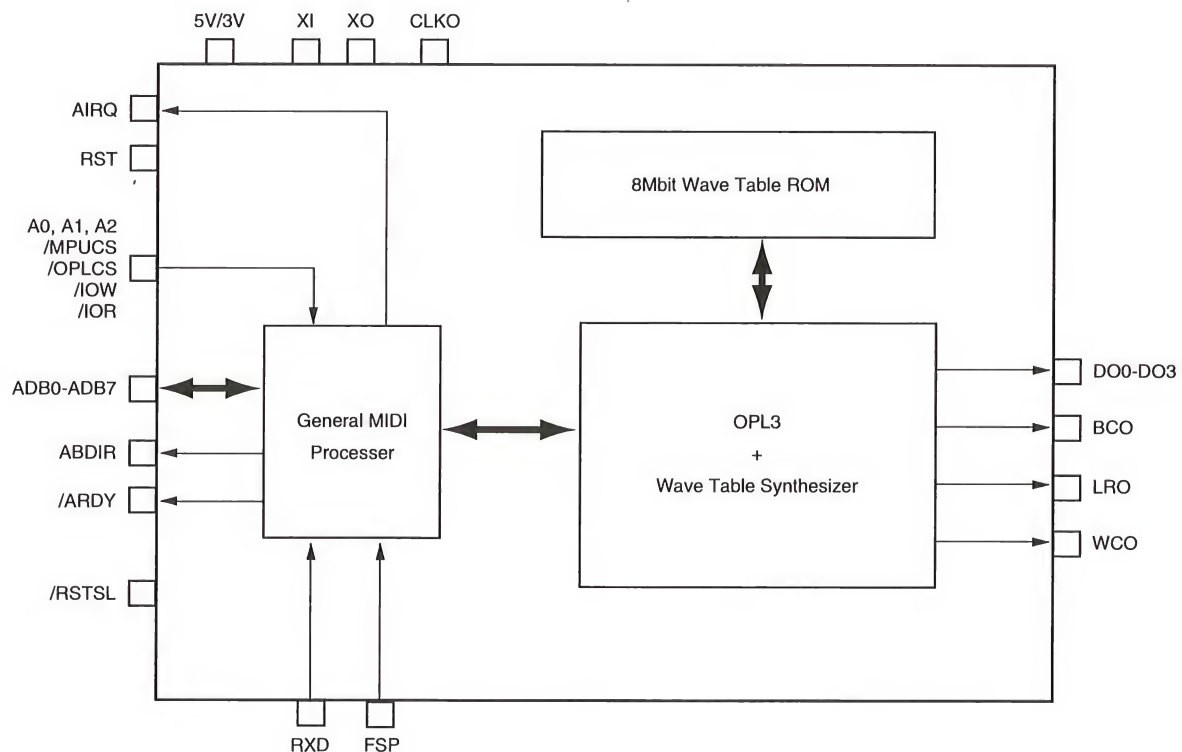
■ OUTLINE

YMF704B is a wave table synthesizer LSI that integrates OPL3-L, General MIDI processor and wavetable ROM into one chip. It complies with GM system level 1.

■ FEATURES

- Complies with GM system level 1.
- MIDI signal can be transmitted either through serial or parallel input.
- Interface compatible with MPU-401 UART mode.
- Built-in OPL3-L FM synthesizer.
- Wave table synthesizer up to 24 simultaneous voices.
- Wave ROM with 8Mbit wave data.
- All registers are readable.
- Either 5V or 3.3V power supply voltage.
- 100-pin QFP, 100-pin SQFP.

■ BLOCK DIAGRAM



SOUND GENERATOR

YMF701 *OPL*TM

OPL3-SA(OPL3 Single chip Audio)

■ APPLICATION EXAMPLES

Multimedia PC, Sound board for PC, PC card

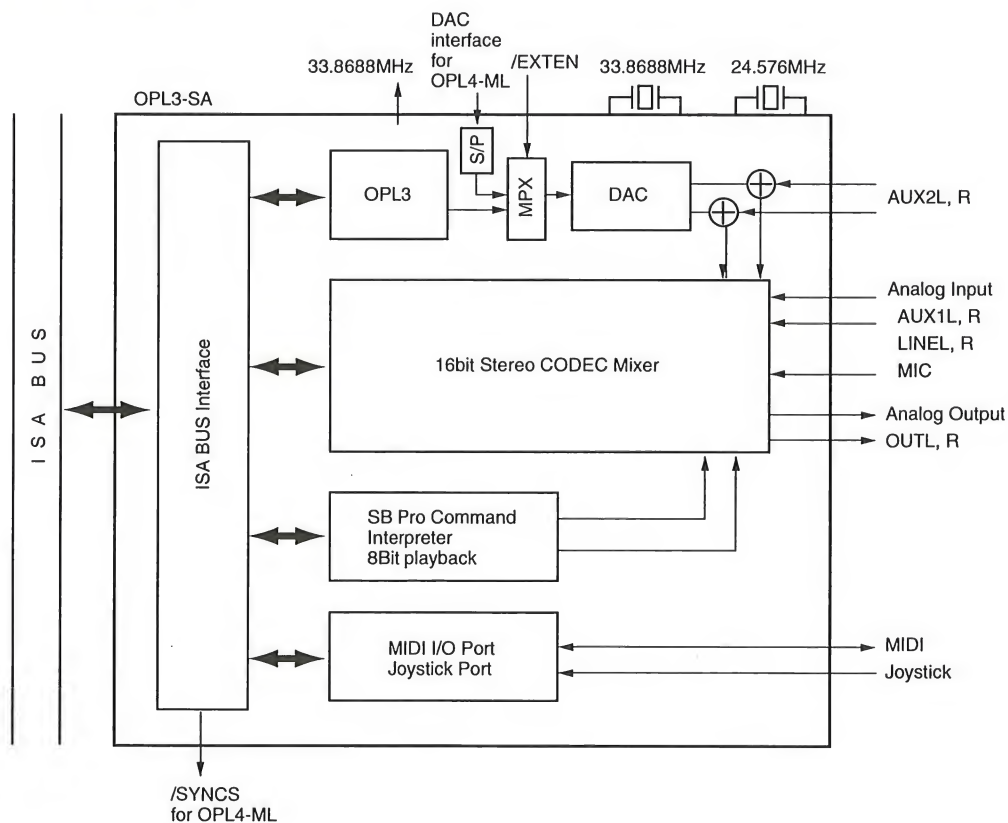
■ OUTLINE

YMF701 is a single chip multimedia audio LSI that supports software for Sound Blaster Pro and Windows Sound System interface. It integrates OPL3, D/A converter for OPL3, 16-bit sigma-delta stereo CODEC, MPU-401 compatible MIDI interface, joystick port with timer, and software programmable ISA bus interface.

■ FEATURES

- Built-in OPL3-L FM synthesizer.
- Built-in 16-bit sigma-delta stereo CODEC.
- Sound Blaster Pro compatibility.
- Dual DMA with FIFO for full Duplex.
- Supports IMA ADPCM, A-Law, μ -Law compression/decompression.
- MPU-401 compatible MIDI interface.
- Joystick port with timer(NE558).
- Built-in 6-channel stereo mixer.
- Four-channel analog input.
- Power down mode.
- Dual master clock input(24.576MHz, 33.8688MHz).
- 100-pin SQFP.

■ BLOCK DIAGRAM



SOUND GENERATOR

YMF708 *OPL*TM

OPL3-3D (OPL3 Single chip Audio with 3D)

Preliminary

■ APPLICATION EXAMPLES

Multimedia PC, Sound board for PC

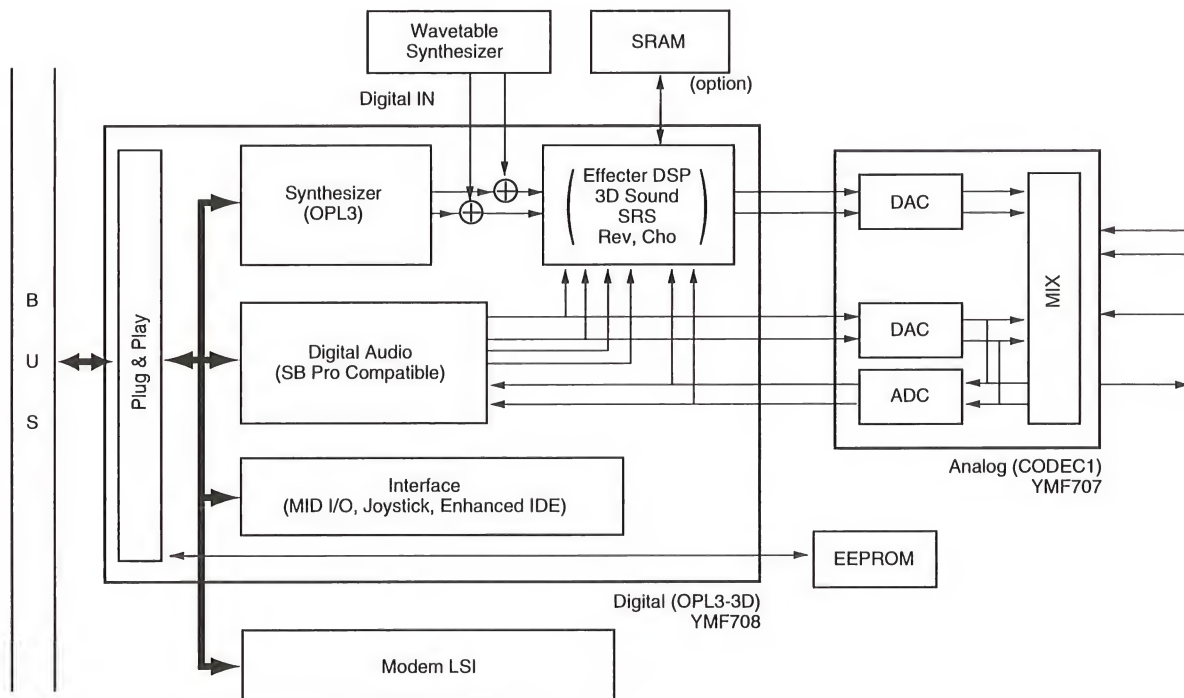
■ OUTLINE

YMF708 is a single chip multimedia audio LSI with 3D sound effect function.

■ FEATURES

- Built-in OPL3 FM synthesizer.
- Sound Blaster Game Compatibility.
- Full Plug & Play ISA compatibility.
- 16-bit address decode.
- MPU-401 compatibility.
- YSOUND(Yamaha 3D), SRS, Equalizer.
- External synthesizer(OPL4-ML) interface.
- IDE(ATAPI) CD-ROM interface.
- CODEC(YMF707) interface.
- 160-pin QFP.

■ BLOCK DIAGRAM



SOUND GENERATOR

YMF707

CODEC1 (CODEC with mixer)

Preliminary

■ APPLICATION EXAMPLES

Multimedia PC, Sound board for PC

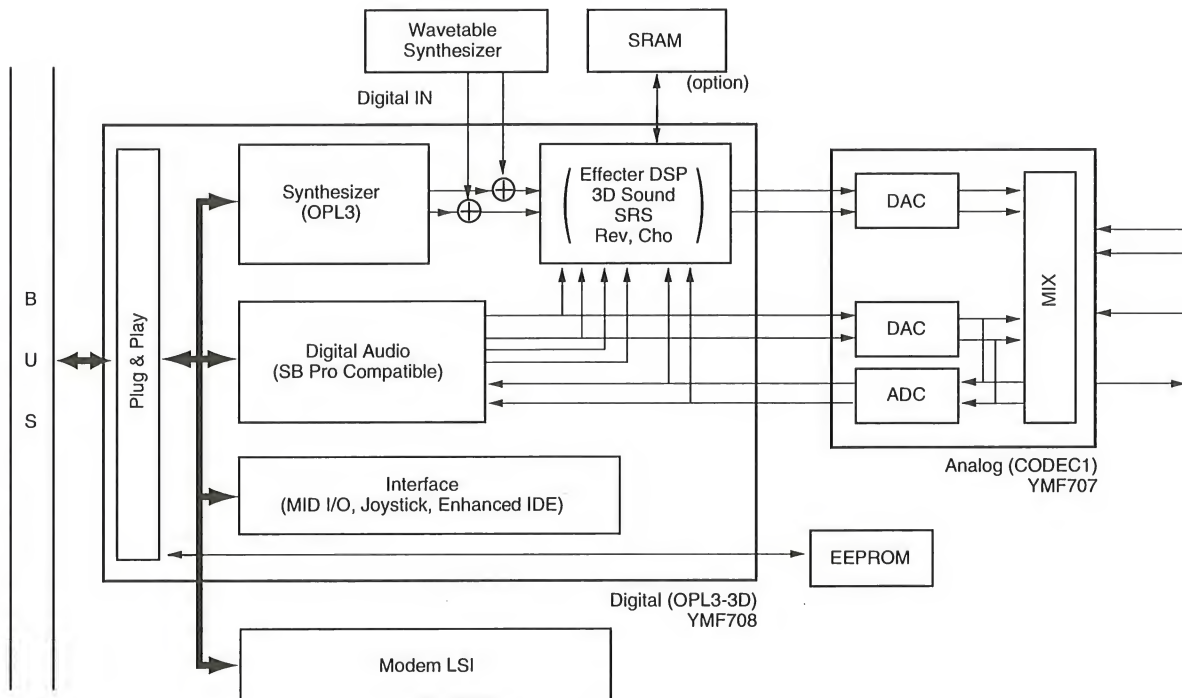
■ OUTLINE

YMF707 is a CODEC LSI with 2-channel A/D converter and D/A converter supporting YMF708(OPL3-3D).

■ FEATURES

- 2-channel ADC/DAC.
- 2-channel 18-bit D/A converter for FM synthesizer.
- 5-channel stereo, 3-channel mono recording mixer.
- 5-channel stereo, 3-channel mono playback mixer.
- Sampling rate: 4kHz to 50kHz.
- 44-pin QFP.

■ BLOCK DIAGRAM



SOUND GENERATOR

YMF289B *OPL*TM OPL3-L

(OPL3 FM synthesizer Low Voltage version)

■ APPLICATION EXAMPLES

IBM-PC compatible mother board, PCMCIA sound card

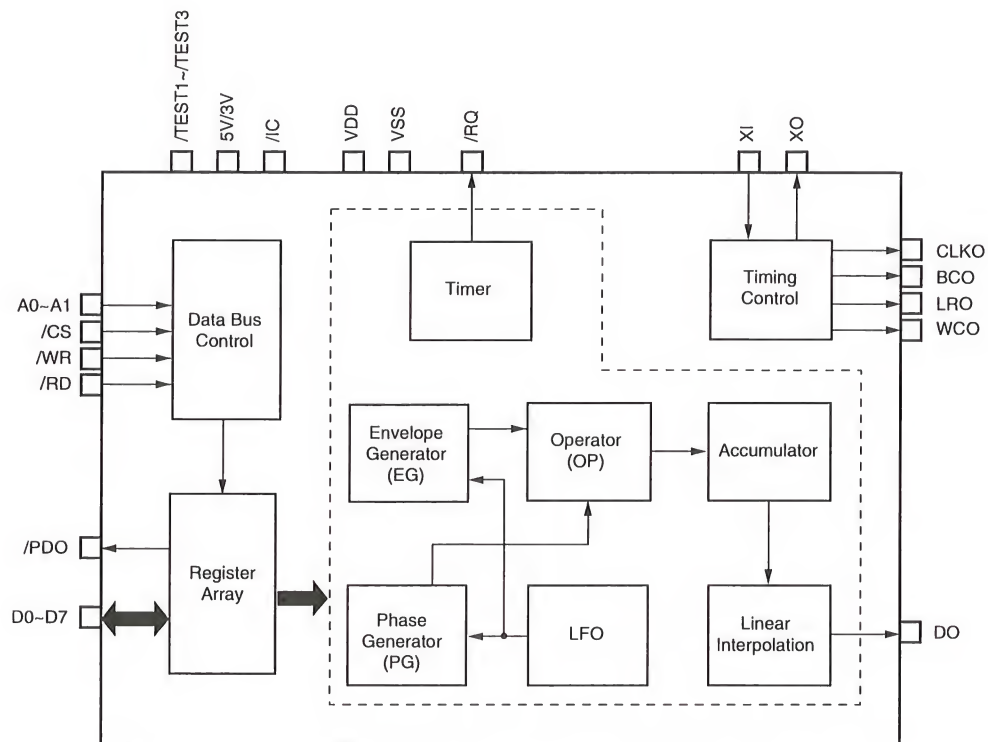
■ OUTLINE

YMF289B is an FM synthesizer specially designed for Notebook PC and PCMCIA card. Power-down mode and 3.3 voltage driven functions have been added to the industry standard YMF262 (OPL3) .

■ FEATURES

- Register-compatible with YMF262.
- 44.1kHz sampling frequency.
- All registers are readable.
- 5V or 3.3V power supply, power down mode.
- Direct interface with DAC YAC516.
- 44-pin QFP, 48-pin SQFP.

■ BLOCK DIAGRAM



SOUND GENERATOR

YM3812 ^{OPL™} OPL2 (FM Synthesizer)

■ APPLICATION EXAMPLES

IBM-PC compatible sound card.

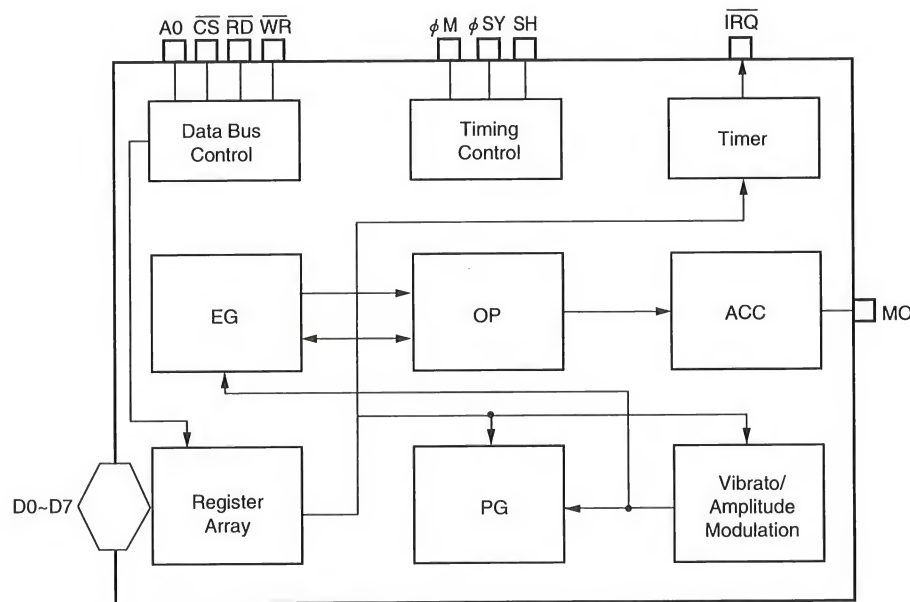
■ OUTLINE

YM3812 is an FM synthesizer for IBM-PC compatible sound card, teletext instrument, and video game.

■ FEATURES

- 2-operator FM synthesis.
- 9 simultaneous sounds or 6 simultaneous sounds with 5 rhythm sounds are selectable.
- Direct interface with the serial DAC YM3014B.
- 24-pin DIP, 24-pin SOP.

■ BLOCK DIAGRAM



YM3014B DAC (Serial Input Floating D/A Converter)

■ OUTLINE

YM3014B is a floating D/A converter for YM3812.

■ FEATURES

- 16-bit dynamic range.
- 10-bit mantissa and 3-bit exponent.
- Built-in analog switches for sample and hold.
- 8-pin DIP, 16-pin SOP.

SOUND GENERATOR

YAC513 DAC (2-Channel Floating D/A Converter)

■ OUTLINE

YAC513 is a D/A converter for YMZ280B.

■ FEATURES

- 2-channel floating D/A converter.
- 16-bit dynamic range.
- Internal conversion from MSB first 16-bit digital data to floating point data.
- Built-in analog switches for sample and hold operations.
- 16-pin DIP, 16-pin SOP.

YAC516 DAC16-L

(Delta Sigma Modulation D/A converter with oversampling filter)

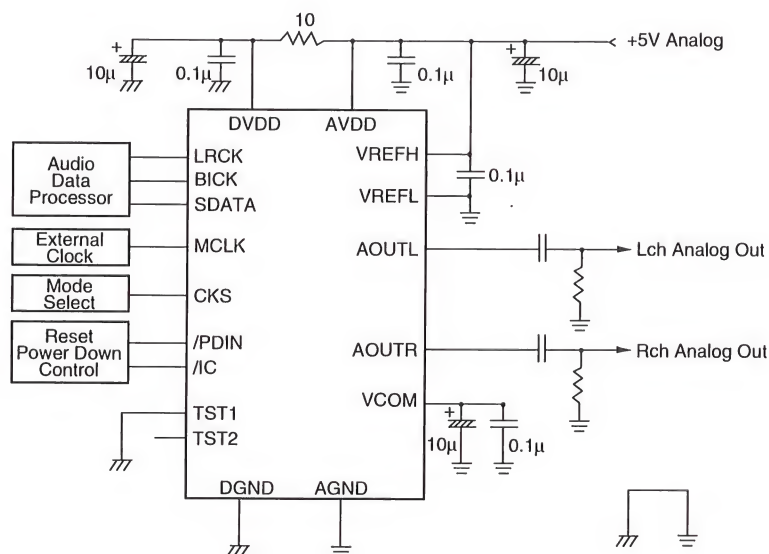
■ OUTLINE

YAC516 is a delta sigma D/A converter for YMF289B and YMZ280B.

■ FEATURES

- Sampling rate ranging from 10kHz to 50kHz.
- On chip 8 times over-sampling filter.
- On chip post filter and output buffer.
- Wide voltage operation: 3V~5.25V
- Low power consumption: 75mW at 5V, power-down mode.
- 24-pin SSOP, 28-pin SOP.

■ SYSTEM DESIGN



SOUND GENERATOR

YM2413 OPLL (FM synthesizer)

■ APPLICATION EXAMPLES

Game machine

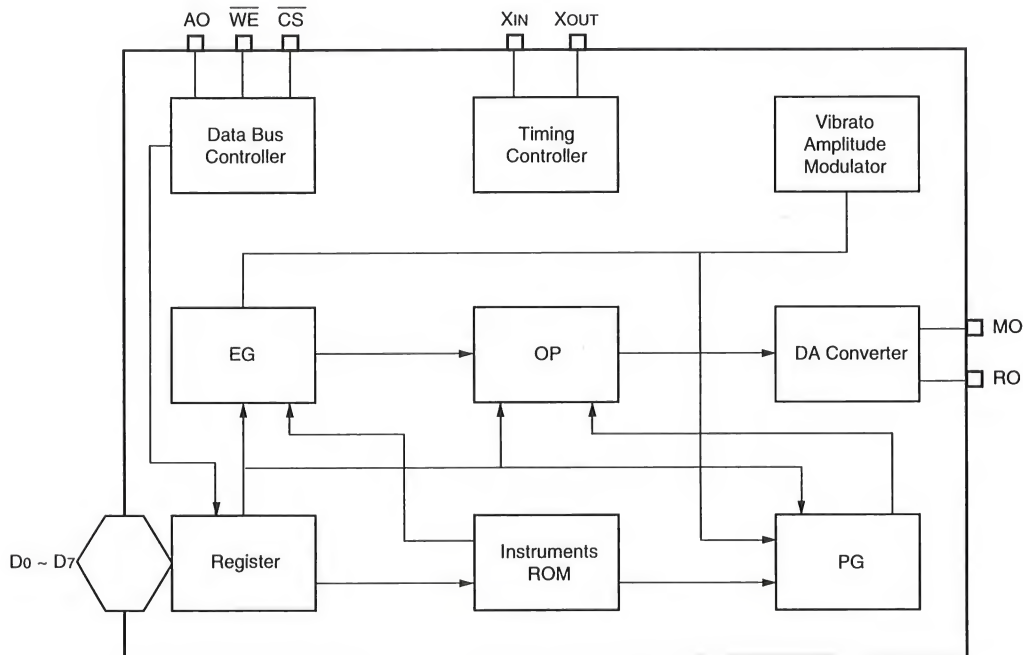
■ OUTLINE

YM2413 is an easy-controlled 2-operator FM synthesizer with built-in preset instruments data and DAC.

■ FEATURES

- 2-operator FM synthesis.
- 9 simultaneous sounds or 6 melody sounds plus 5 rhythm sounds are selectable.
- Built-in instruments data (15 melody tones, 5 rhythm tones) .
- Built-in D/A converter.
- 18-pin DIP.

■ BLOCK DIAGRAM



SOUND GENERATOR

YM2149 SSG (Software-Controlled Sound Generator)

APPLICATION EXAMPLES

Game machine

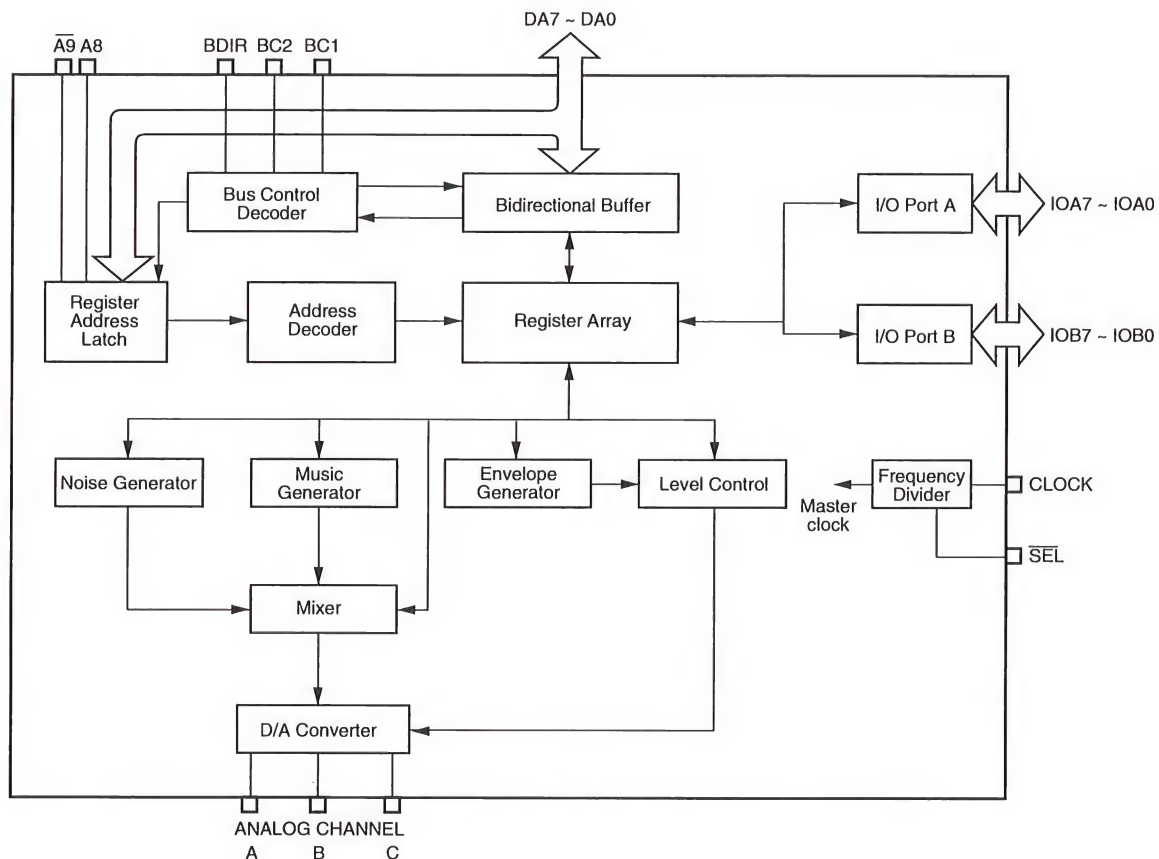
OUTLINE

YM2149 is a melody and effect sound generator LSI, having square wave, noise and envelope generators.

FEATURES

- Easy connection to 8 bit or 16 bit CPU
- Simple connection to external system through 2 sequence 8 bit I/O port
- Wide voicing range of 8 octaves
- Smooth attenuation by 5-bit envelope generator
- Built-in 5 bit D/A converter
- 40-pin DIP
- Pin compatible with GI AY-3-8910

BLOCK DIAGRAM



SOUND GENERATOR

YMZ284 SSSL (Software-controlled Sound Generator)

■ APPLICATION EXAMPLES

Game machine

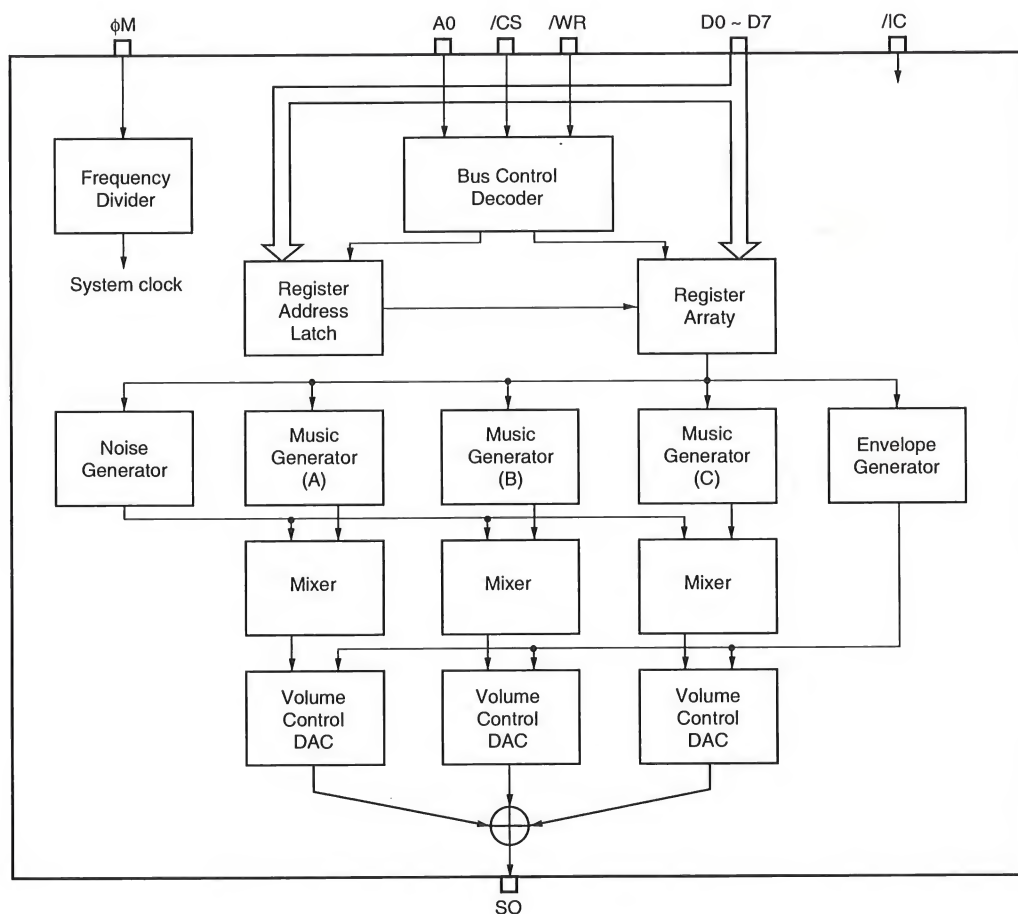
■ OUTLINE

YMZ284 is an easy-controlled melody and effect sound generator LSI, having square wave, noise and envelope generators. Compared to YM2149, I/O ports have been eliminated for compact packaging and CPU interface functions have been improved.

■ FEATURES

- Three sequence square wave generators and one noise generator, software-compatible with the YM2149 (SSG)
- 3 built-in 5-bit D/A converters and mixed output
- CPU interface through /CS, /WR control signal and 8 bit data bus
- Wide voicing range of 8 octaves
- Smooth attenuation by 5-bit envelope generator
- 16-pin DIP, 16-pin SOP.

■ BLOCK DIAGRAM



SOUND GENERATOR

YMZ280B PCMD8 (8-Channel PCM/ADPCM Decoder)

■ APPLICATION EXAMPLES

Arcade game machine, Entertainment equipment.

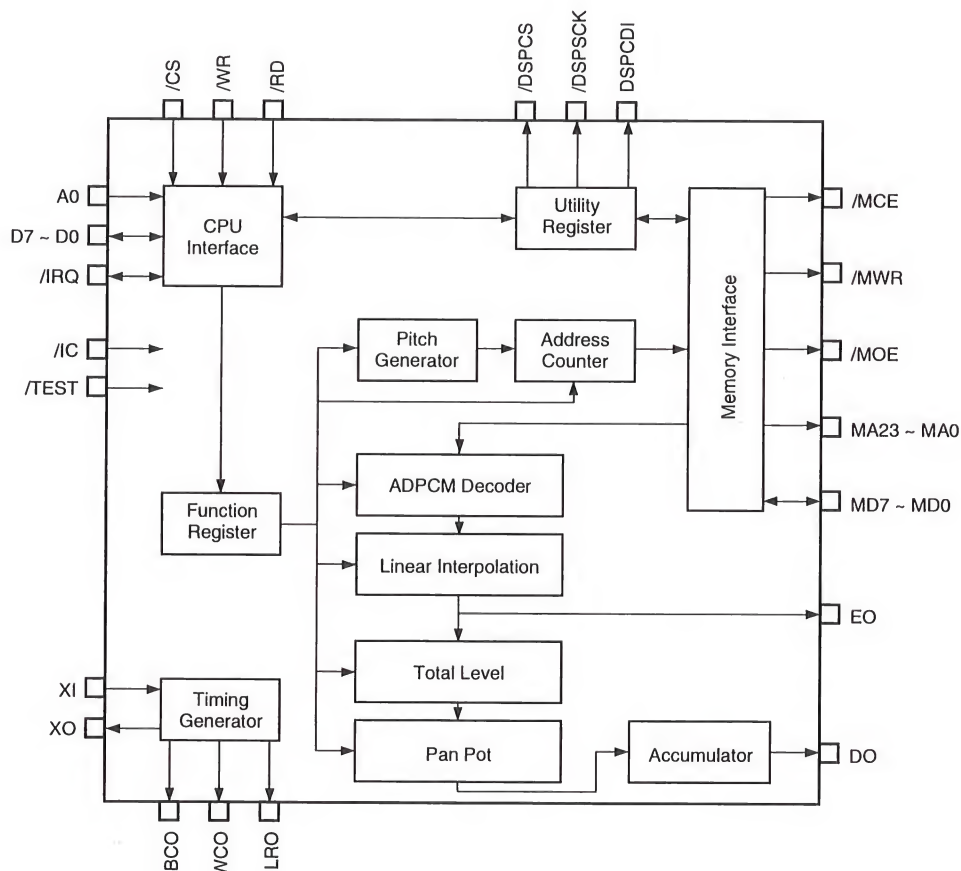
■ OUTLINE

YMZ280B is a CPU-controlled PCM/ADPCM sound generator which simultaneously plays back 8-channel wave data stored in the external wave data memory.

■ FEATURES

- Generates 8 voices simultaneously.
- Selectable wave data format among 4-bit ADPCM, 8-bit linear PCM, or 16-bit linear PCM.
- Maximum of 16Mbyte direct access area for wave data.
- External ROM or SRAM selectable.
- Wave data can be rewritten during sound playing back.
- 127Hz~88.2kHz playback frequency control (up to 44.1kHz for 4-bit ADPCM) .
- Loop playback between two selected addresses.
- Outputs L/R channel mixing data. (Volume and panpot can be set for each of 8 channels.)
- L/R extension output is separately available for one of 8 channels.
- 16-bit 2's complement MSB 1st output for DAC YAC513 or YAC516.
- 64-pin QFP.

■ BLOCK DIAGRAM



SOUND GENERATOR

YMZ705

SSGS (SSG & ADPCM playback with Sequencer)

Preliminary

■ APPLICATION EXAMPLES

Arcade game machine, Video game machine

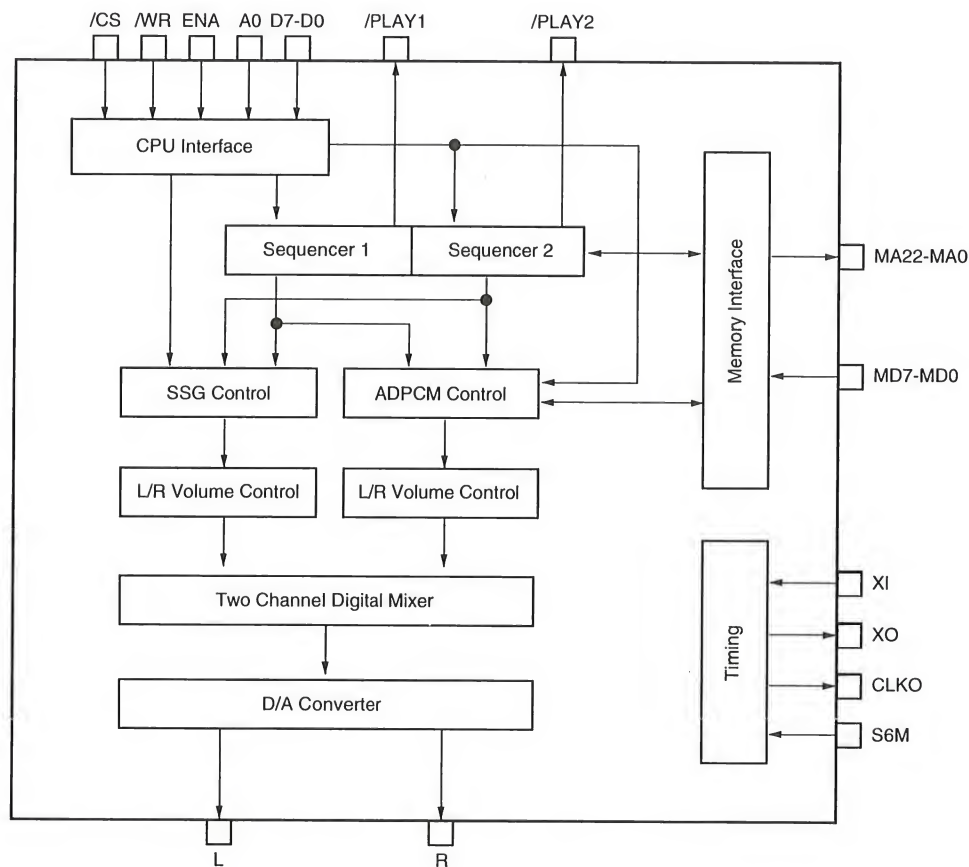
■ OUTLINE

YMZ705(SSGS) is an automatic playback LSI with built-in ADPCM and YM2149-equivalent SSG synthesizer.

■ FEATURES

- Built-in two YM2149(SSG) synthesizers generate six square waves and two noise waves simultaneously.
- Eight ADPCM voices selected from 64 voice data in the external ROM can also be generated simultaneously.
- Up to 8Mbytes external ROM for music data and ADPCM data can be connected.
- Pan-pot effect can be applied to the voices independently.
- 64-pin QFP.

■ BLOCK DIAGRAM



SOUND GENERATOR

YMU277 FM Music L (FM Music Player)

■ APPLICATION EXAMPLES

Clock, Music box, Telephone

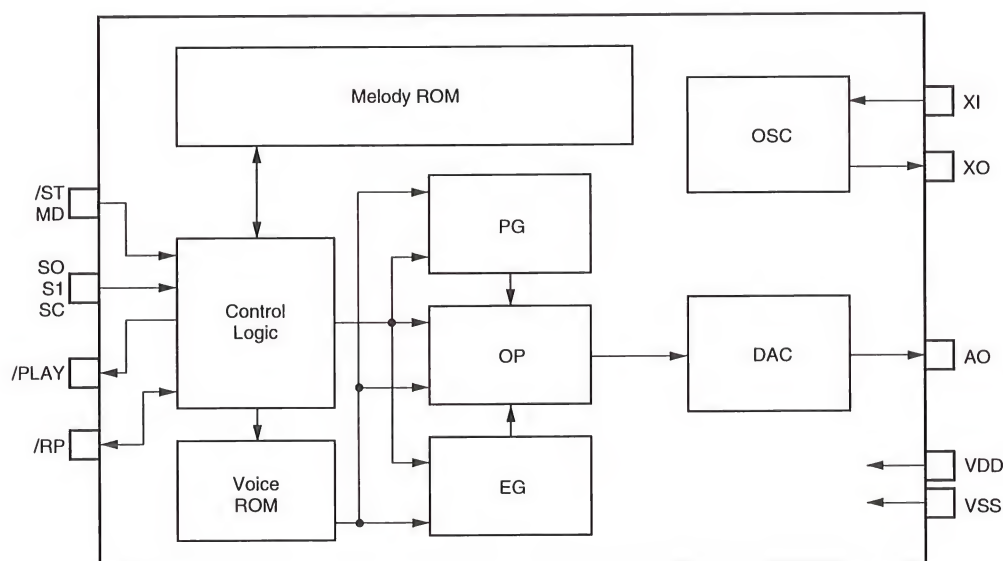
■ OUTLINE

YMU277 is a low-voltage operation custom melody FM synthesizer LSI for automatic music playing back.

■ FEATURES

- 2-operator FM synthesizer.
- 3-octaves sound range.
- Generates 4 simultaneous voices.
- Musical performance data for up to 4 melodies within 255 steps.
- Up to 4 timbres can be set for 1 melody (or 1 phrase) .
- Maximum of 8 timbre presets for 8 melodies. (14 timbres are available from the manufacture.)
- Level hold or one shot playback is possible.
- Binary and serial melody selection modes.
- Built-in DAC and crystal oscillator circuit.
- 2.4~5.25V power supply.
- Stand-by mode.
- Low power consumption.
- 16-pin DIP, 16-pin SOP.

■ BLOCK DIAGRAM



DIGITAL AUDIO

YDC112B CDC2 (CD-ROM Data Controller 2)

■ APPLICATION EXAMPLES

CD-ROM drive

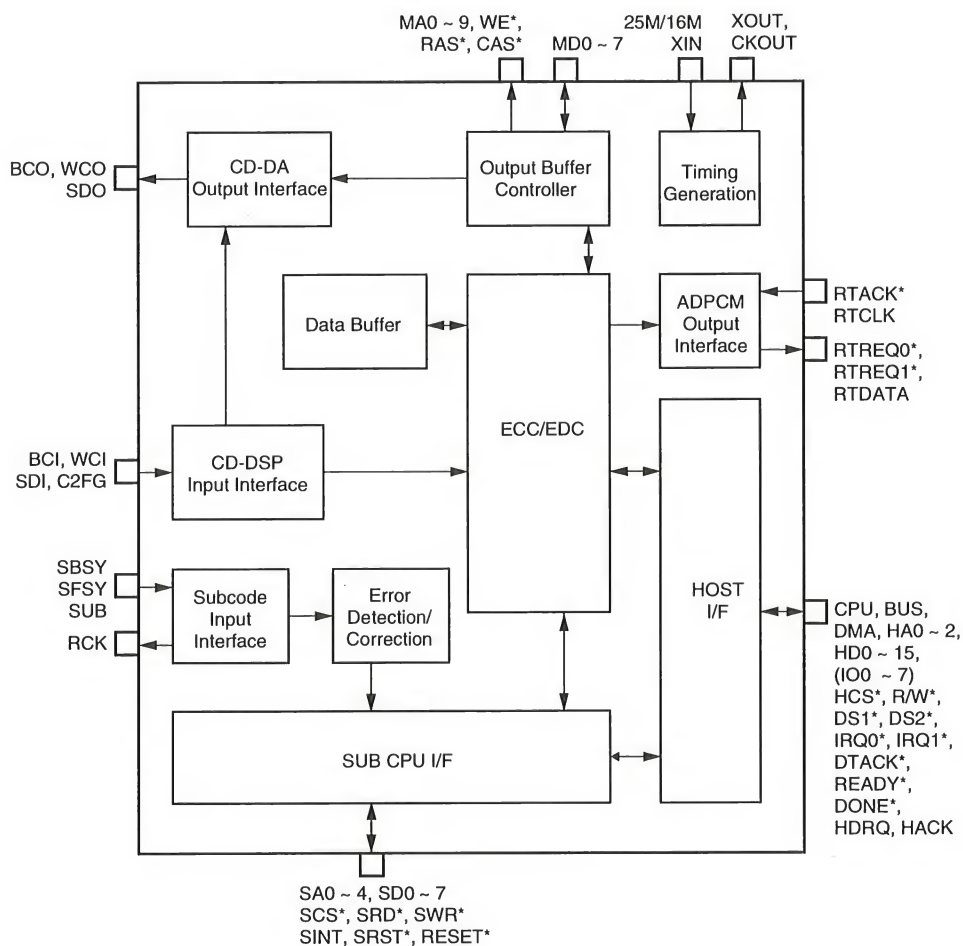
■ OUTLINE

YDC112B is a CD-ROM decoder LSI supporting 6-times speed playing back.

■ FEATURES

- Real-time error detection/correction (ECC/EDC)
- Supports CD-ROM, CD-ROM XA and CD-I format
- Internal 48k bit SRAM for ECC/EDC buffer
- Interface with any CD audio signal processing LSI serial output
- Supports 6-times speed playing back
- Supports maximum 1M byte output data buffer external DRAM.
- Interface with both 80XX and 68000 host bus (8/16 bit data bus selectable)
- Direct interface with DMA and SCSI controllers
- Command, Status, Remote-control data for sub CPU and host CPU communications
- 100-pin QFP

■ BLOCK DIAGRAM



DIGITAL AUDIO

YSF210B OSF22 (22-bit Oversampling Digital Filter)

■ APPLICATION EXAMPLES

High-end audio equipment.

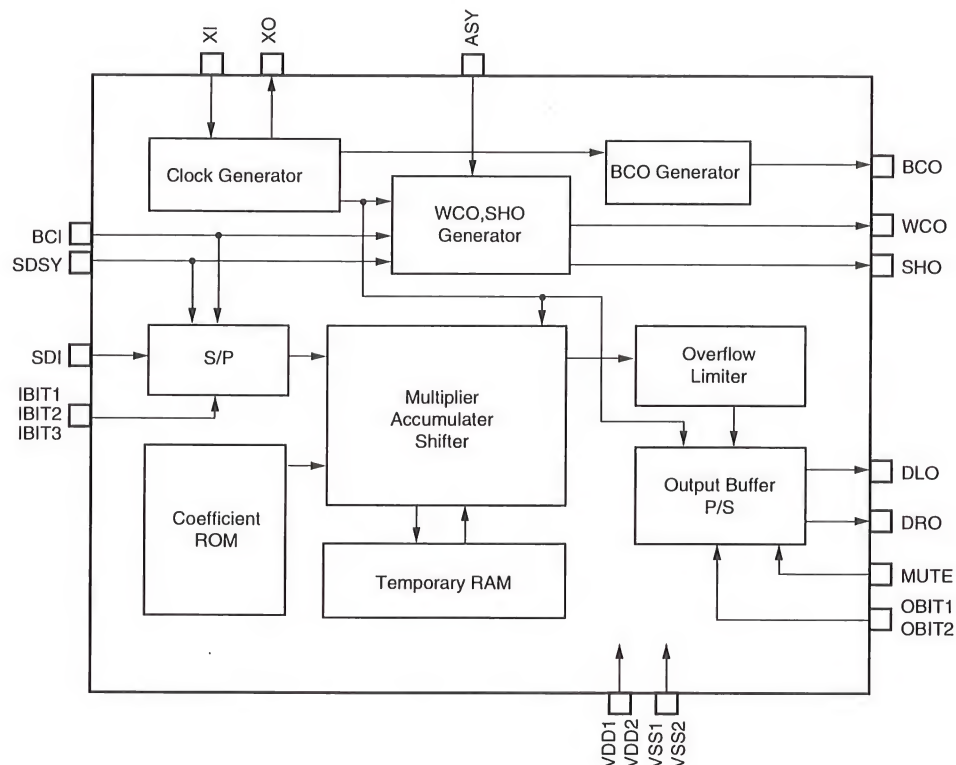
■ OUTLINE

YSF210B is a 2-channel, 8-times oversampling digital filter with 22-bit audio signal input/output.

■ FEATURES

- 8-times oversampling digital filter exclusively for 2DAC system.
- Input selection from 16/18/20/22 bits and output from 18/20/22 bits.
- Noise shaping for 18/20 bits output.
- Linear phase FIR type filters (225-order, 41-order and 21-order) connected sequentially.
- 22-bit floating point multiplication and addition by 23×22 bit multiplier (with a built-in overflow limiter)
- Filter characteristics
 - Stop band attenuation : -100 dB or more (0.5465fs~7.4535fs)
 - Pass band ripple : within ± 0.00005 dB (0~0.4535fs)
- 384fs system clock in synchronous mode and 432fs or more in asynchronous mode.
- Sampling frequency : 32kHz, 44.1kHz, and 48kHz.
- 24-pin DIP, 24-pin SOP.

■ BLOCK DIAGRAM



DIGITAL AUDIO

YM3434 AFUDF (8-times Oversampling Digital Filter)

APPLICATION EXAMPLES

Digital audio equipment.

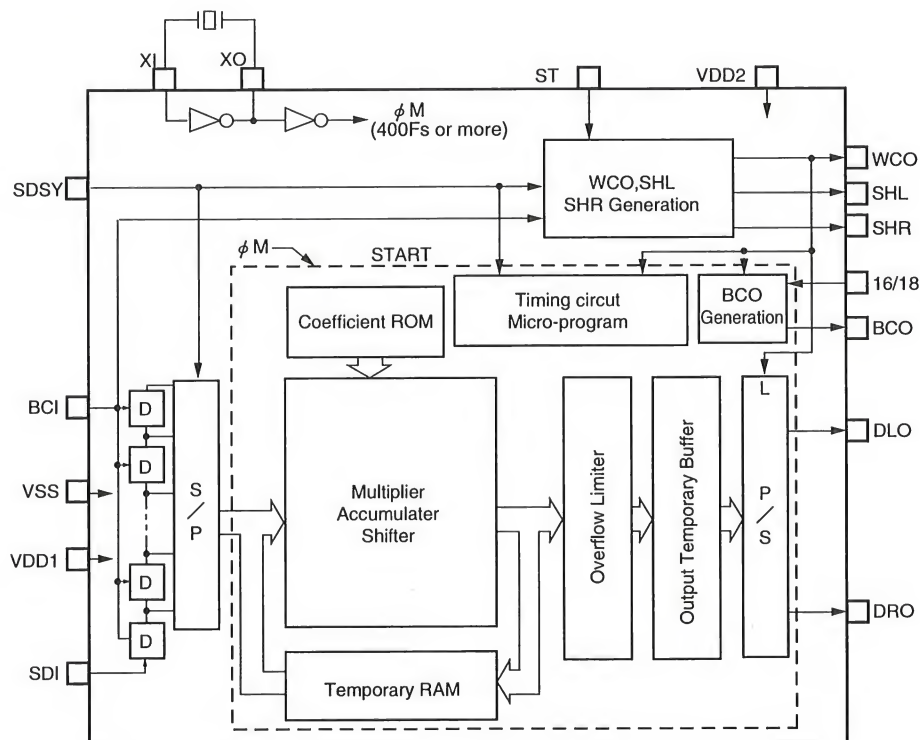
OUTLINE

YM3434 is a 2-channel 8-times oversampling digital filter for audio equipments.

FEATURES

- Operation with a system clock (400fs or more) independent of the serial input signal.
- Sampling frequencies are 32kHz, 44.1kHz, and 48kHz.
- Input bit clock rates 32fs, 48fs, 64fs, 80fs, 96fs, 112fs, 128fs, 144fs, 160fs, 176fs, 192fs can be handled without external circuit.
- Linear phase FIR type filters connected in 3 vertical stages.
 - 1st filter : 225-order FIR filter.
 - 2nd filter : 41-order FIR filter.
 - 3rd filter : 21-order FIR filter.
- Built-in overflow limiter.
- Filter characteristics (at 8-times)
 - Pass band ripple : max. $\pm 0.0001\text{dB}$ at 0 to $0.4535 \times f_s$.
 - Stop band attenuation : min. -100dB at $0.5465 \times f_s$ to $7.4535 \times f_s$.
- 16-bit/18-bit output switchable.
- 1DAC (4-times) / 2DAC (8-times) switchable.
- 16-pin DIP.

BLOCK DIAGRAM



DIGITAL AUDIO

YM3433B

ALCDF (8-times Oversampling Digital Filter)

APPLICATION EXAMPLES

Digital audio equipment, TV.

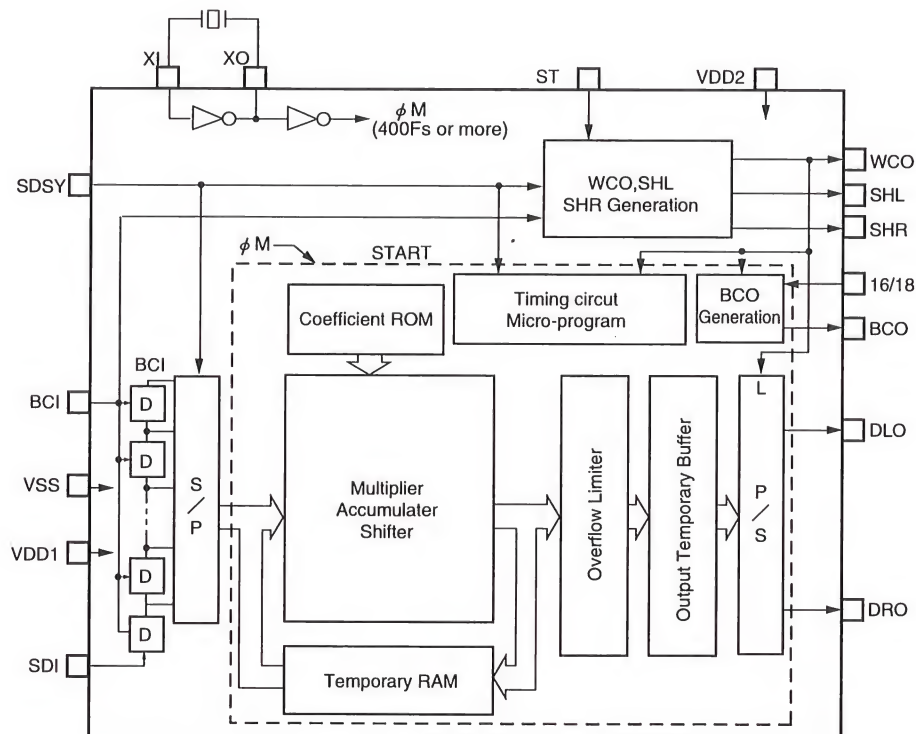
OUTLINE

YM3433B is a 2-channel 8-times oversampling digital filter, pin-compatible with YM3434.

FEATURES

- Operation with a system clock (400fs or more) independent of the serial input signal.
- Sampling frequencies are 32kHz, 44.1kHz, and 48kHz.
- Input bit clock rates 32fs, 48fs, 64fs, 80fs, 96fs, 112fs, 128fs, 144fs, 160fs, 176fs, 192fs can be handled without external circuit.
- Linear phase FIR type filters connected in three vertical stages.
 - 1st. filter : 161-order FIR filter.
 - 2nd. filter : 33-order FIR filter.
 - 3rd. filter : 17-order FIR filter.
- Built-in overflow limiter.
- Filter characteristics (at 8-times)
 - Pass band ripple : max. $\pm 0.002\text{dB}$ at 0 to $0.4535 \times f_s$.
 - Stop band attenuation : min. -70dB at $0.5465 \times f_s$ to $7.4535 \times f_s$.
- 16-bit/18-bit output switchable.
- 1DAC (4-times) / 2DAC (8-times) switchable.
- 16-pin DIP, 24-pin SOP.

BLOCK DIAGRAM



DIGITAL AUDIO

YM3437C^{DIT2} (Digital Audio Interface Transmitter 2)

■ APPLICATION EXAMPLES

Audio equipment with digital audio interface output.

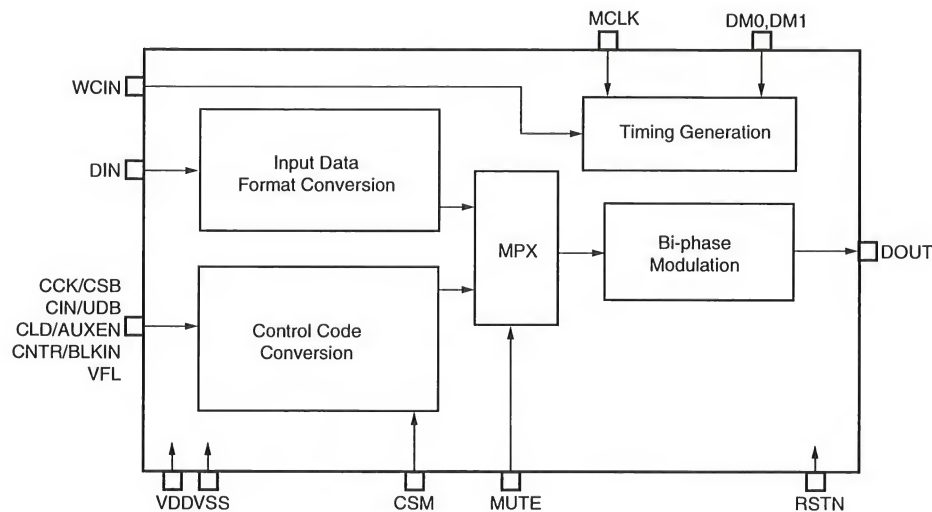
■ OUTLINE

YM3437C outputs digital audio interface signals conforming to AES/EBU or EIAJ.

■ FEATURES

- Operates with the external master clock (MCLK).
- The sampling frequency is between 30kHz and 50kHz.
- With audio auxiliary control, the length of the audio sample word can be either 20-bit audio data with 4 audio auxiliary bits, or 24-bit audio data with no audio auxiliary bit.
- The V, C, and U bits can be added to the data.
- The control code can be input serially or in parallel. With serial input, the first 4 bytes (32bits) of channel status bits and the first 4 bytes (32bits) of user data bits can be input. With parallel input, the V, U, and C bits can be input.
- The digital audio interface data output can be muted with the MUTE signal input.
- 16-pin DIP, 16-pin SOP.

■ BLOCK DIAGRAM



DIGITAL AUDIO

YSD221

DIT3 (Digital Audio Interface Transmitter 3)

■ APPLICATION EXAMPLES

Audio equipment with digital audio interface output.

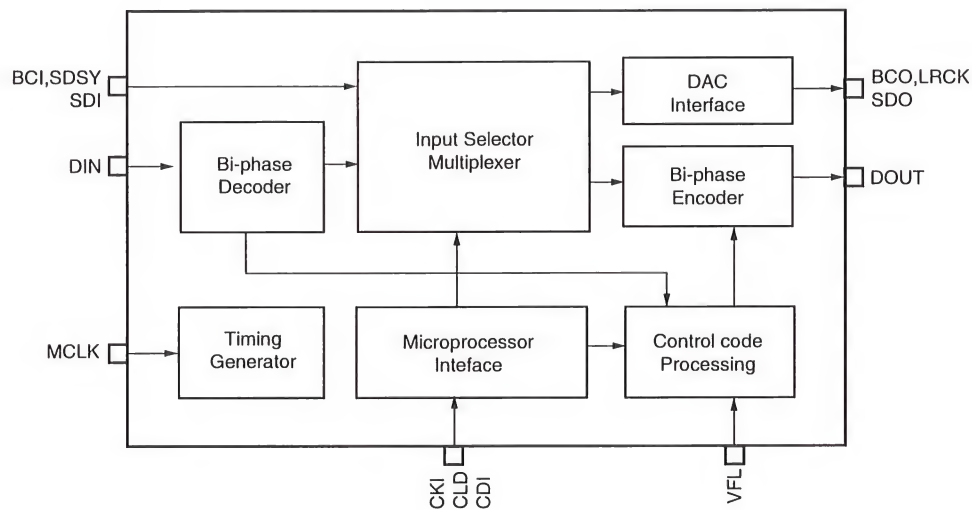
■ OUTLINE

YSD221 outputs digital audio interface (DIF) signals conforming to AES/EBU or EIAJ.

■ FEATURES

- Synchronous operation with the external clock (384fs) input into the MCLK terminal.
- Capable of inputting synchronized DIF signals (DIN) in addition to the digital audio signals (BCI/SDSY/SDI).
- Any input signal channel can be assigned to the output channel for bilingual laser discs.
- Outputs bi-phase modulated DIF signals (DOUT) in addition to the common digital audio signals (BCO/LRCK/SDO) to digital filters.
- Sound signals from a multi-disc player can be fully digitized in conjunction with YM7110.
- 16-pin DIP, 16-pin SOP.

■ BLOCK DIAGRAM



DIGITAL AUDIO

YM3436D DIR2 (Digital Audio Interface Receiver)

■ APPLICATION EXAMPLES

Audio equipment with digital audio interface input.

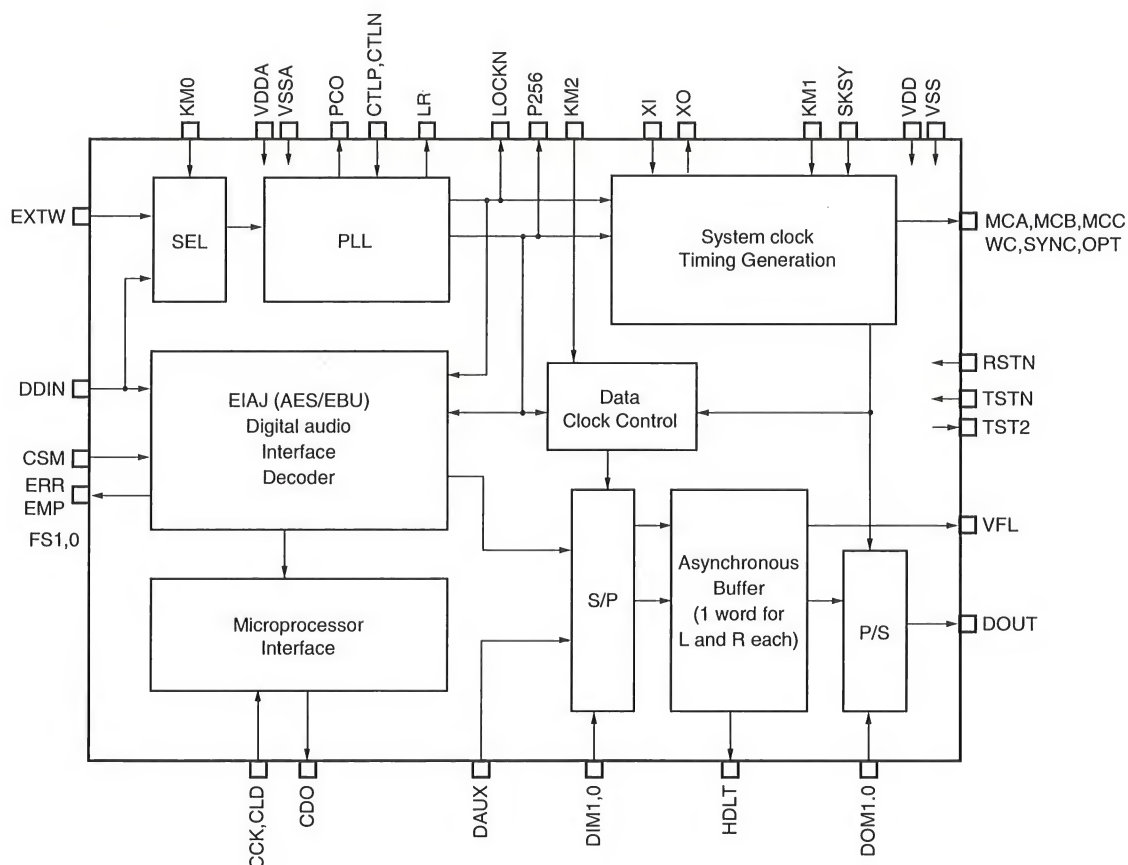
■ OUTLINE

Comparing to YM3623B, external synchronization/error processing functions and channel status/user data usage have been improved for professional audio applications.

■ FEATURES

- Demodulates the digital audio interface signal and outputs 24-bit 2-channel audio data and control data.
- Detects transmission and reception error and executes error processing of data hold and muting.
- Decodes and outputs validity flag, channel status (both for consumer and professional use) and user data as the control data.
- Outputs various kinds of clock signals to the connecting ICs.
- Sampling frequency of the audio interface signal is between 30kHz and 50kHz.
- 44-pin QFP.

■ BLOCK DIAGRAM



DIGITAL AUDIO

YM3623B

DIR (Digital Audio Interface Receiver)

APPLICATION EXAMPLES

Audio equipment with digital audio interface input.

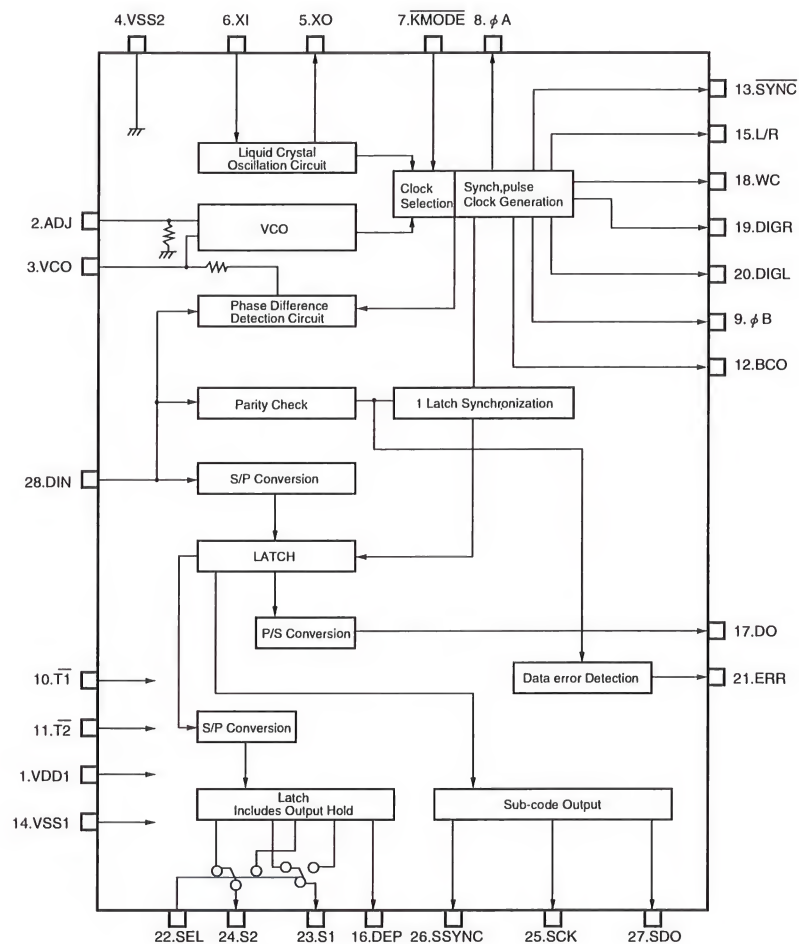
OUTLINE

YM3623B receives and demodulates the digital audio interface format signals conforming to AES/EBU or EIAJ.

FEATURES

- Built-in PLL circuit synchronizes with the digital audio interface signals at 32kHz/44.1kHz/48kHz sampling rate.
- Outputs 16-bit audio signal (MSB first) and timing clock for D/A sample and hold.
- Subcode data can be obtained from CD format signal.
- Outputs sampling frequency, emphasis on/off status, copy enable/disable status, as well as the error status of receiving audio signals.
- In case of error detection in the digital audio interface format signals, the preceding audio data is output again.
- 28-pin DIP.

BLOCK DIAGRAM



DIGITAL AUDIO

YSS231_{GE} (Graphic Equalizer)

■ APPLICATION EXAMPLES

CD player

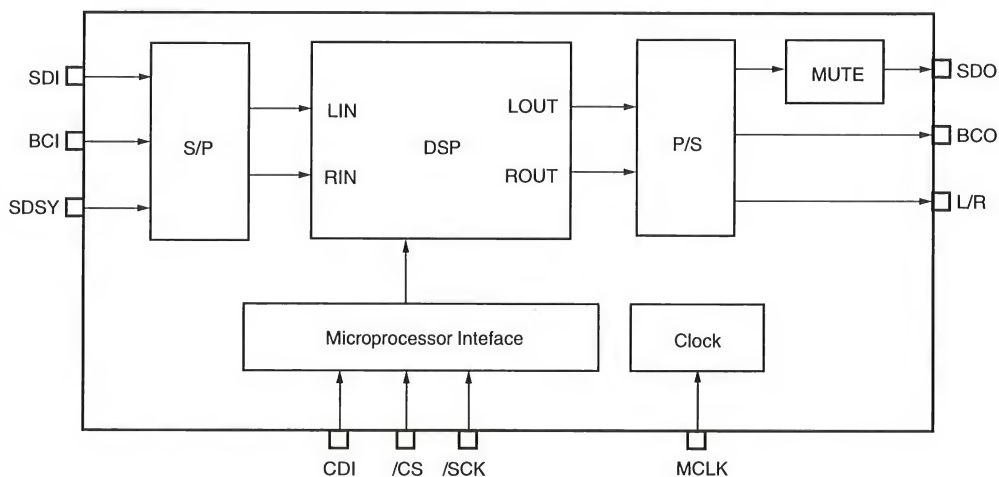
■ OUTLINE

YSS231 is a programmable graphic equalizer with stereo digital input/output. Other audio data processing functions such as de-emphasis, sound multiplex and voice cancelling are also available.

■ FEATURES

- Processing digital data with a sampling frequency of 32k to 48kHz.
- Two operation modes.
- Two operation modes (for 2 channels)
 - De-emphasis + Sound multiplex + 5-band equalizer
 - De-emphasis + Sound multiplex + Voice cancel + 3-band equalizer
- The center frequency, gain, and Q for the equalizer can be set at your option.
- High-speed multiplier, 24 bit data \times 18 bit coefficient value=30 bit data.
- Digital input/output format of 16 bits or 18 bits is selectable in stereo mode.
- Zero cross mute function for selection of four kinds of border value levels.
- Easy setting of commands and coefficient values by the microprocessor interface.
- Master clock of 256fs or 384fs.
- 16-pin DIP, 16-pin SOP.

■ BLOCK DIAGRAM



DIGITAL AUDIO

YSF242

SAP2 (Sound Analysis Processor 2)

Preliminary

■ APPLICATION EXAMPLES

Spectrum analyzer, Mini-component audio system

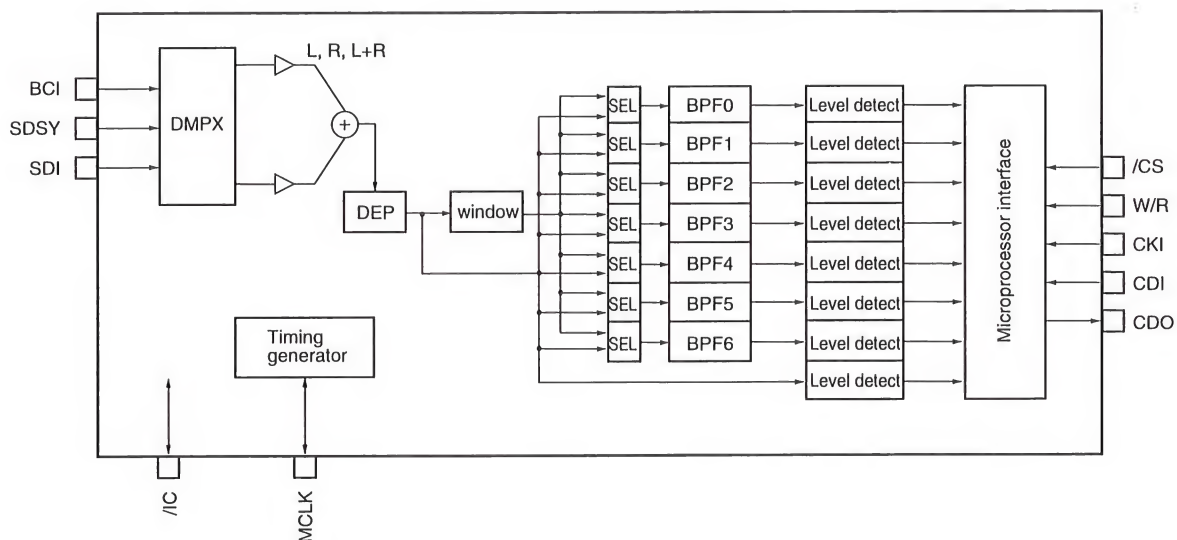
■ OUTLINE

YSF242 performs frequency filtering and level detection for spectrum analysis of the audio signals.

■ FEATURES

- Level detection for digital audio signals of 32k to 48kHz sampling frequency.
- De-emphasis compensation before the level detection.
- Built-in 2-order IIR filter enables the level detection of up to 7 bands and the total level.
- The band frequency can be set up to 11 bands by modifying the coefficient values.
- 16-pin SOP.

■ BLOCK DIAGRAM



DIGITAL AUDIO

YSS220 SP3 (Surround Processor 3)

■ APPLICATION EXAMPLES

Car audio, Hi-Fi audio.

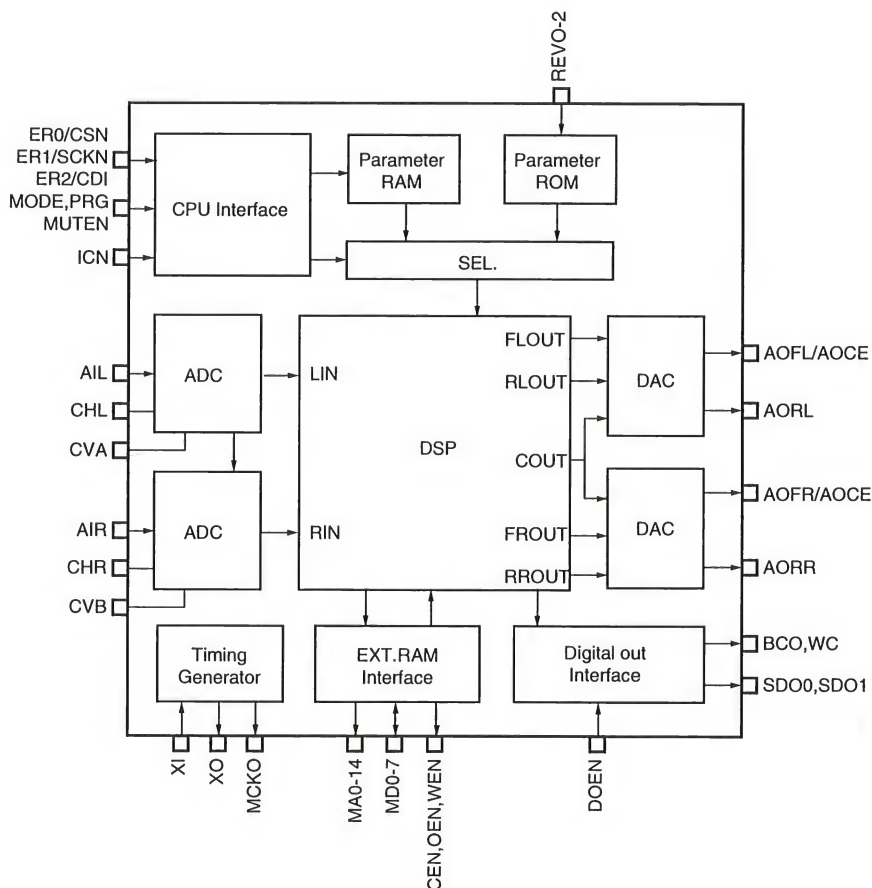
■ OUTLINE

YSS220 is a digital surround sound processor for car and home Hi-Fi audio sets.

■ FEATURES

- 2-channel analog input (15-bit floating A/D) , 5-channel output (15-bit floating D/A for 4 channels)
- Maximum 512ms digital delay by external 256k (32k×8) SRAM or pseudo SRAM (sampling frequency 32kHz)
- High-performance early reflection map and reverberation.
- <Preset mode> for easy control by terminal setting.
- <Register control mode> for original sound processing set by microprocessor interface.
- 128-step DSP with 24×13 bit multiplier.
- 64-pin QFP.

■ BLOCK DIAGRAM



DIGITAL AUDIO

YM7128B SP2 (Surround Processor 2)

APPLICATION EXAMPLES

Audio set, TV, Radio cassette recorder, Karaoke system.

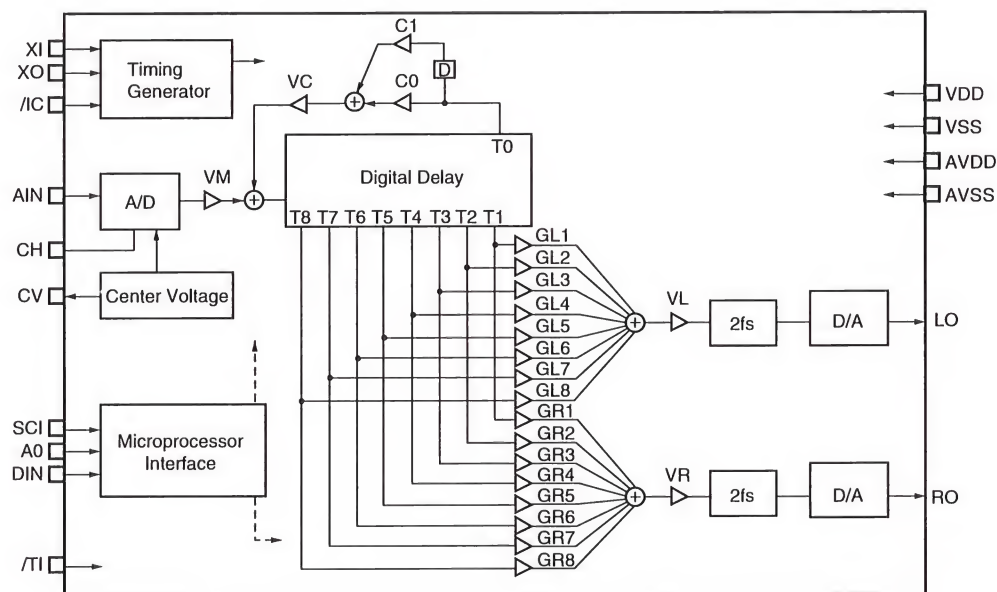
OUTLINE

YM7128B is a digital surround sound processor for Hi-Fi audio and TV sets. Built-in RAM and A/D D/A converters enable easy adoption of YM7128B to the existing analog systems. YM7128B also offers 200ms delay for microphone echo in Karaoke systems.

FEATURES

- 1-channel analog input (14-bit floating A/D) , 2-channel analog output (14-bit floating D/A)
- 100ms digital delay by built-in RAM (sampling frequency 23.6kHz)
- Maximum 200ms digital delay for microphone echo (sampling frequency 11.8kHz)
- 8 delay lines and feedback loop for reverberation.
- Serial microprocessor interface.
- 16-pin DIP, 24-pin SOP.

BLOCK DIAGRAM



DIGITAL AUDIO

YM3428 SPB (Surround Processor-B)

■ APPLICATION EXAMPLES

Audio amplifier, Amplified speaker, TV.

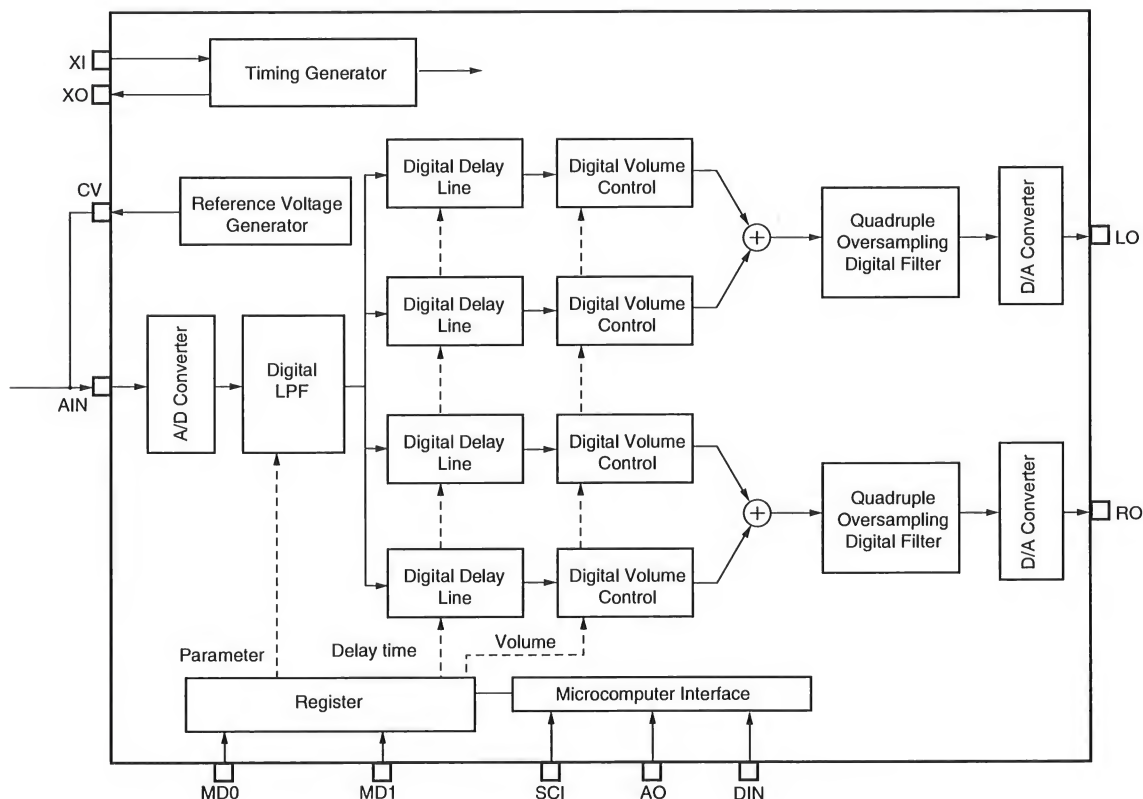
■ OUTLINE

YM3428 is a digital surround sound processor LSI for Hi-Fi audio and TV sets. Built-in RAM and A/D D/A converters enable easy adoption of YM3428 to the existing analog systems.

■ FEATURES

- 1-channel analog input (14-bit floating A/D) , 2-channel analog output (14-bit floating D/A)
- 30ms digital delay by built-in RAM (sampling frequency 24.9kHz)
- 4 delay lines and IIR digital low-pass filter parameters are set by microprocessor.
- 3 types preset surround modes by terminal setting.
- 16-pin DIP.

■ BLOCK DIAGRAM



DIGITAL AUDIO

YSS241 DPLD2 (Dolby Pro Logic Decoder 2)

■ APPLICATION EXAMPLES

Dolby surround TV, Satellite receiver

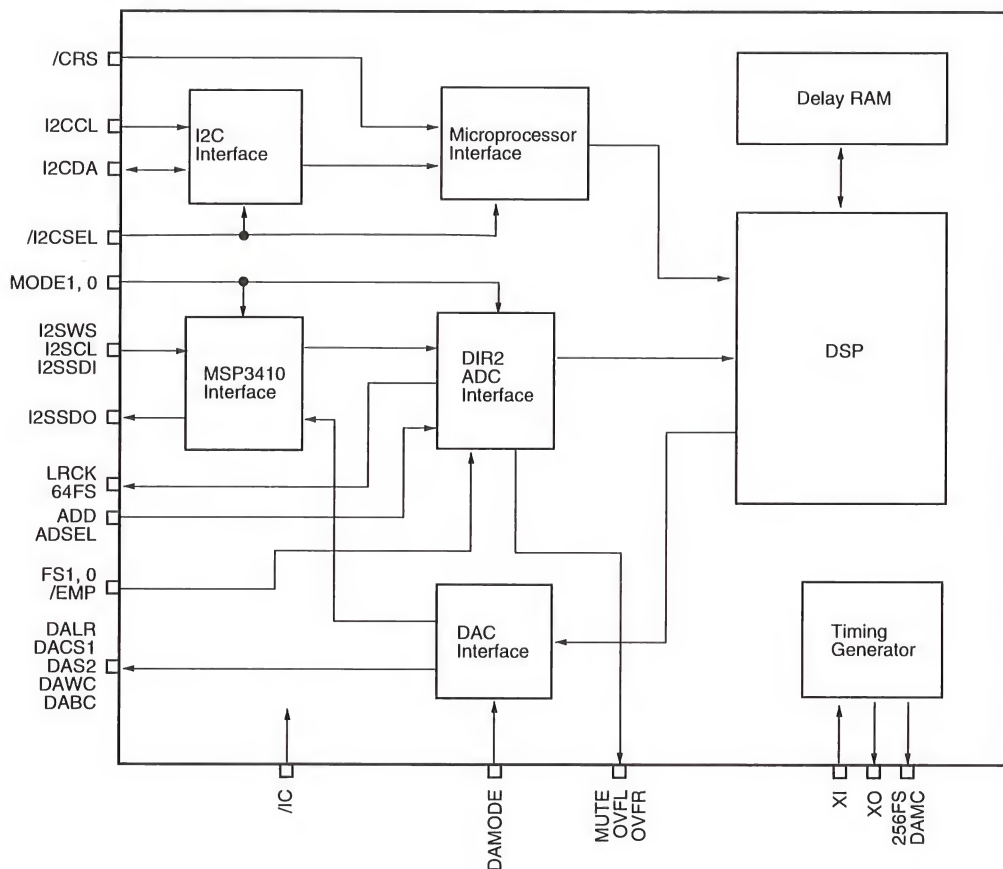
■ OUTLINE

YSS241(DPLD2) is a Dolby Pro Logic decoder LSI offering high-quality sound by "all digital" data processing.

■ FEATURES

- Direct digital interface with ITT semiconductor's MSP3410.
- Yamaha original preset surround modes.
Enhanced mode that emphasizes Dolby Pro Logic decoder function.
Pseudo-stereo effect for monaural sound source.
Front-wide effect for normal stereo sound source.
- Dolby Pro Logic decoder block
Automatic balance control, Steering logic, Center mode control, 30ms digital delay, noise generator, modified B-type noise reduction decoder.
- Parameter control by microprocessor through I²C or Yamaha proprietary serial interface.
- 64-pin QFP.

■ SIGNAL FLOW (Dolby Pro Logic mode)



DIGITAL AUDIO

YSS215_{AVSP} (Audio & Visual Surround Processor)

■ APPLICATION EXAMPLES

TV, Satellite receiver, Hi-Fi audio amplifier.

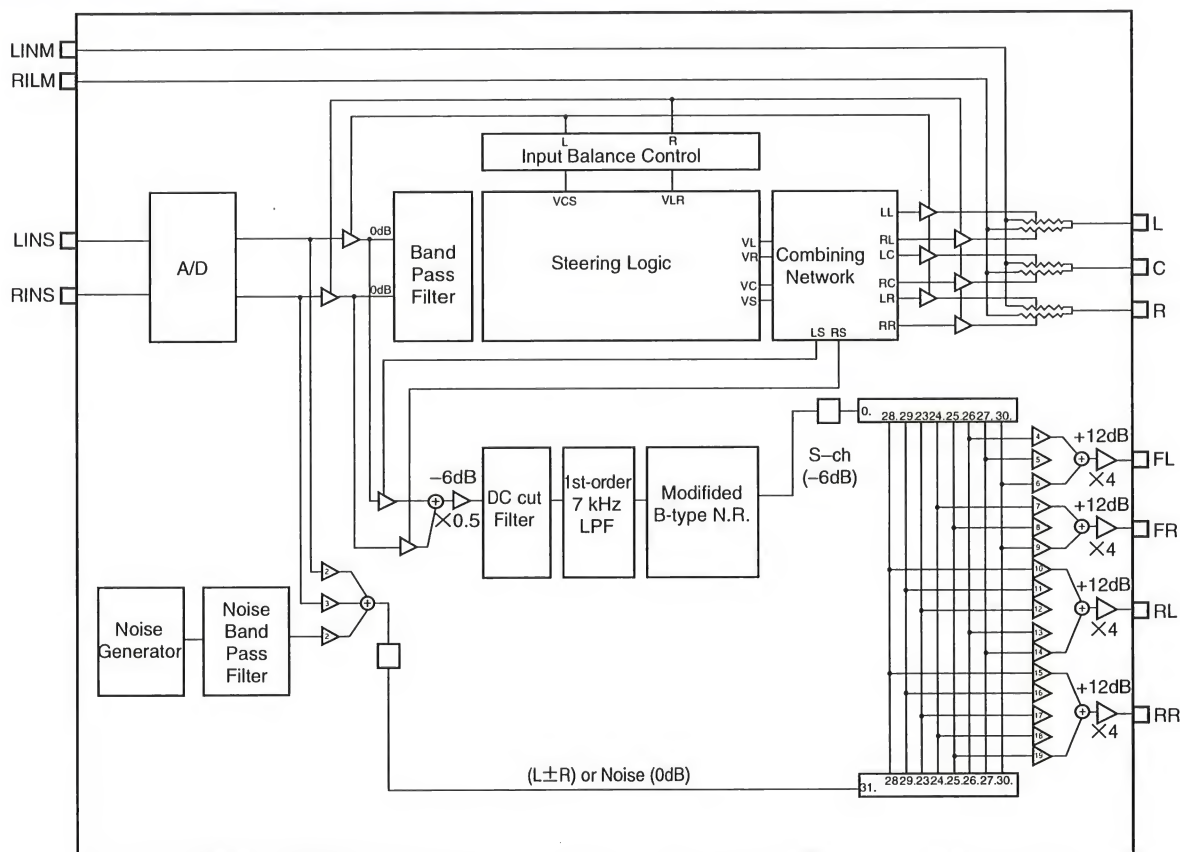
■ OUTLINE

YSS215 is an integrated Dolby Pro Logic decoding and digital sound field simulation LSI for TV and Hi-Fi audio sets. YSS215 also offers Yamaha special mixture mode of Dolby Pro Logic and sound field simulation.

■ FEATURES

- 32-bit word length internal signal processing.
- Built-in adaptive matrix, noise generator, 7kHz low-pass filter, modified B-type N.R.decoder and A/D & D/A converters.
- Auto input-balance control circuit.
- 29-tap original simulation surround with maximum delay of 370ms.
- External 256k pseudo SRAM for 16-bit linear digital delay.
- 8-tap delay lines can be mixed in Dolby Pro Logic mode.
- Serial interface to microprocessor.
- Dolby reference operation level 300mV r.m.s.
- Master clock 11.2896MHz, sampling frequency 44.1kHz.
- 64-pin QFP.

■ SIGNAL FLOW (Dolby Pro Logic mode)



DIGITAL AUDIO

YSS243

Preliminary

AC3F (AC3 5.1ch Full Decoder)

■ APPLICATION EXAMPLES

DVD player, LD player, Digital amplifier

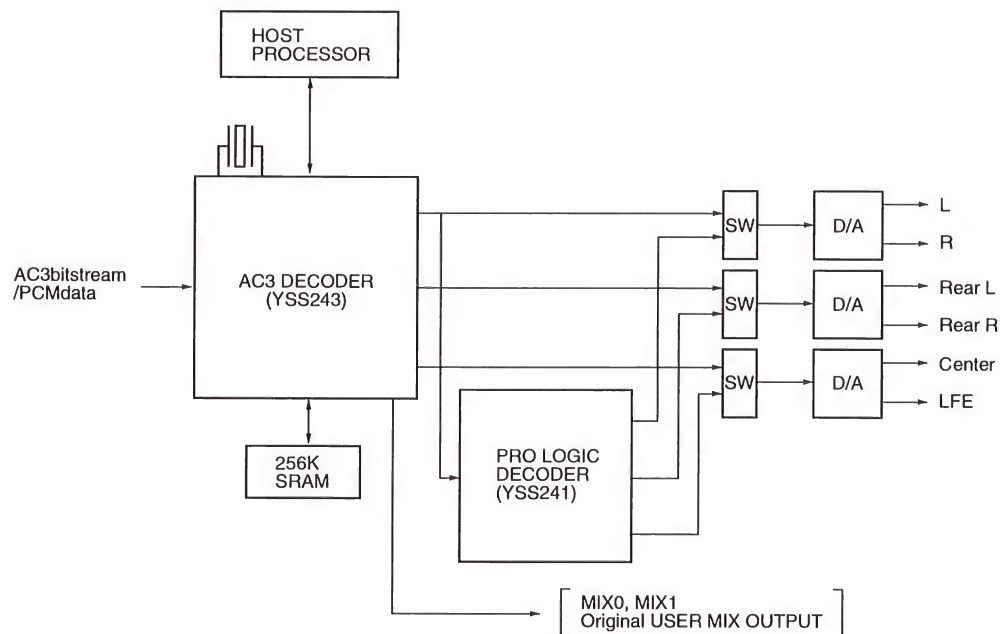
■ OUTLINE

YSS243 is a Dolby AC3 5.1ch full decoder which converts AC3 bitstream data (IEC958 format) to PCM data.

■ FEATURES

- Dolby AC3 5.1ch decode full spec support (including downmixing).
Maximum bit rate 640kbps.
- AC3 karaoke mode support.
- Built-in input buffer, 256kbit external SRAM for output buffer.
- Internal oscillator (20MHz) with PLL for use with external crystal (2.5 -20MHz).
- Multi-Language data decode. (possible to decode by data-stream-number)
- Pink noise and White noise generator.
- 2 original user mix output channels (MIX0, MIX1) added to L, C, R, LS, RS.
- Programmable center and surround channel delays.
- User original compression mode added to 4 Dolby recommended compression modes.
- Dynamic range compression support.
- AC3 bitstream information can be read from microprocessor interface.
- Constant AC3 decode time delay (3 audio blocks: 768 samples).
- 128-pin QFP.

■ SYSTEM BLOCK DIAGRAM



5.1ch AC3 + PRO LOGIC DECODER SYSTEM

DIGITAL AUDIO

YSS205B_{KP} (Karaoke Processor)

■ APPLICATION EXAMPLES

Karaoke system.

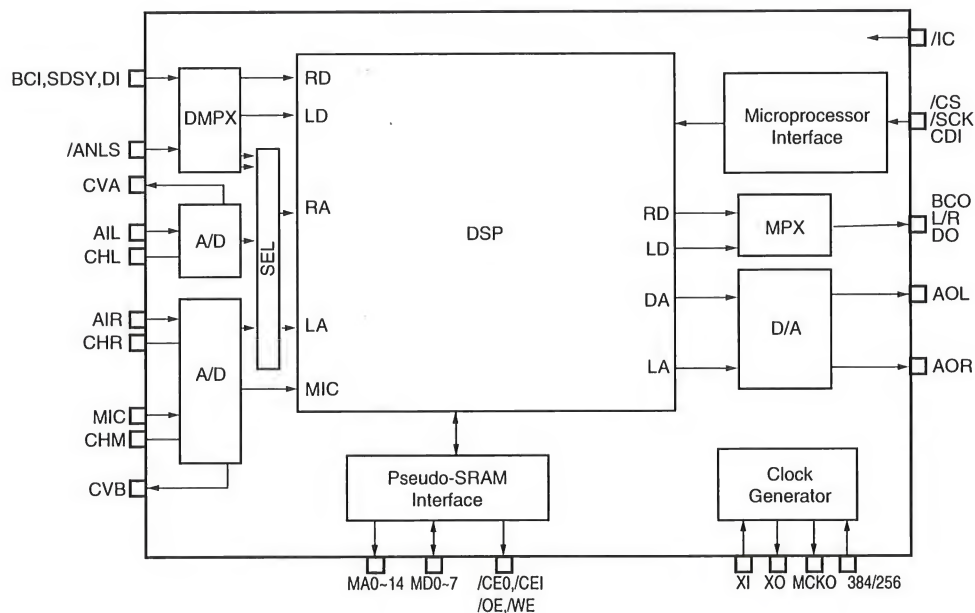
■ OUTLINE

YSS205B is a digital signal processing LSI for Karaoke systems. All functions of Karaoke including key control, digital echo and voice cancellation can be done by single chip. YSS205B also offers high-quality digital surround function.

■ FEATURES

- Digital or analog input/output.
- 3-channel (L, R, MIC) 15-bit floating A/D converter and 2-channel 15-bit floating D/A converter.
- 5 types operation modes.
- Maximum of 370ms digital data stored in one external pseudo-SRAM (fs 44.1kHz)
- Key control in ± 1 octave.
- High quality digital echo by multiple taps.
- Serial interface to microprocessor.
- 64-pin QFP.

■ BLOCK DIAGRAM



DIGITAL AUDIO

YSS216B

KP2 (Karaoke Processor 2)

■ APPLICATION EXAMPLES

Karaoke system, Video CD

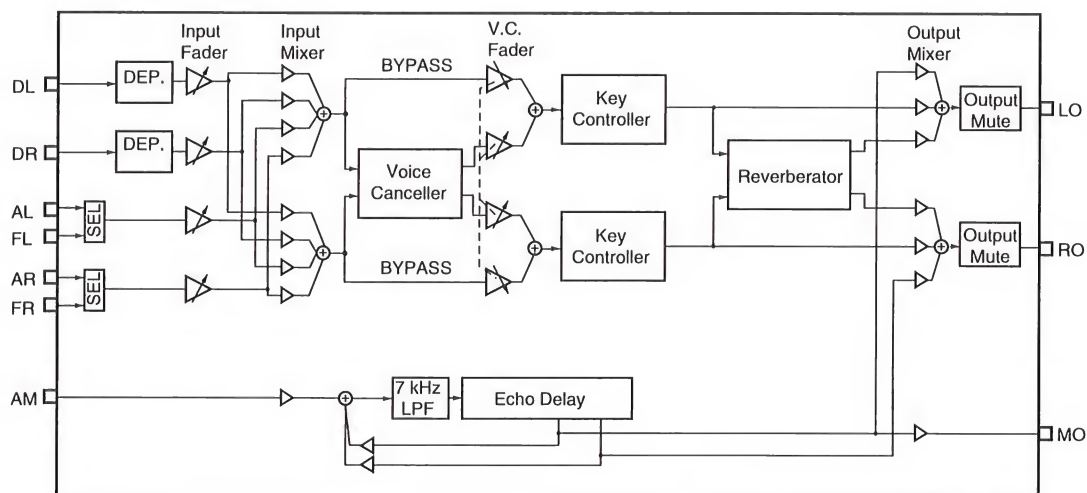
■ OUTLINE

YSS216B is an easy-controlled digital signal processing LSI for Karaoke systems. All functions of Karaoke including key control, digital echo and voice cancellation can be done by single chip. The YSS216B also offers digital surround function.

■ FEATURES

- Digital or analog input/output.
- 3-channel (L, R, MIC) 15-bit floating A/D converter and 1-channel 15-bit floating D/A converter.
- De-emphasis processing for digital input signal.
- Mixing and fade in/out processing for digital/analog signal.
- Voice cancel processing to attenuate center-positioned voice.
- Key control of ± 600 cent range in 50 cent steps. (1 octave=1200 cents)
- Microphone echo up to 200ms.
- Surround signal processing with 4 preset patterns.
- Serial interface to microprocessor.
- 1 external 256k (64k \times 4) DRAM.
- Master clock 384fs, sampling frequency 44.1kHz.
- 64-pin QFP.

■ SIGNAL FLOW



DIGITAL AUDIO

YSS222^{KPB} (Karaoke Processor B)

■ APPLICATION EXAMPLES

Karaoke system, Tape recorder, VTR.

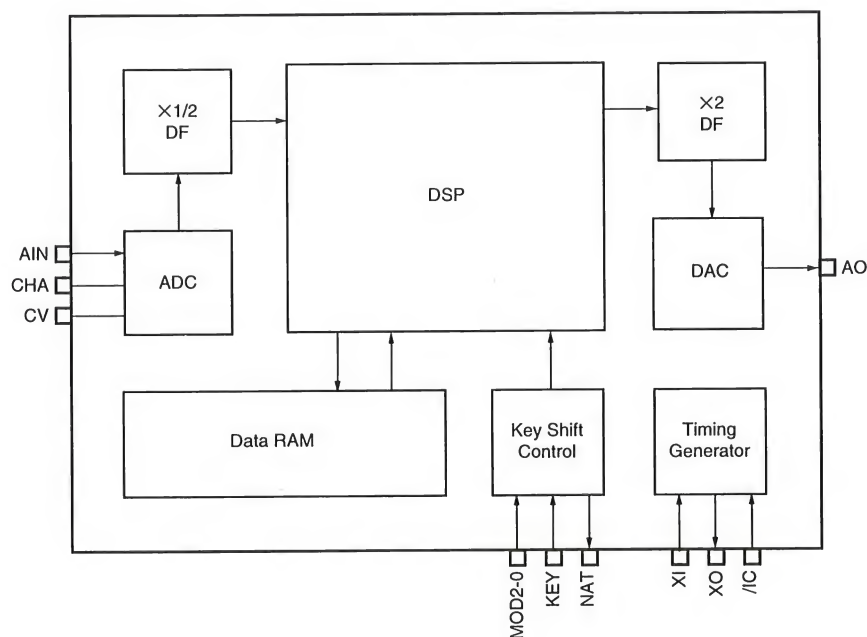
■ OUTLINE

YSS222 is an easy-controlled 1-channel key controller LSI for Karaoke and business-use tape recorder. The key shift can be controlled by the pulse or analog voltage input to the terminals, without an external microprocessor.

■ FEATURES

- Key control of -1800 cent to $+1200$ cent in 100 cent steps.
- Built-in 14-bit floating A/D and D/A converters (32kHz sampling) .
- Internal signal processing sampling frequency 16kHz.
- Built-in RAM.
- 3 selective modes to specify key shift amount (Analog voltage/Switch pulse/Microprocessor pulse mode) .
- Master clock 768kHz (48fs) .
- 16-bin DIP, 24-pin SOP.

■ BLOCK DIAGRAM



DIGITAL AUDIO

YSS239

KPC (Karaoke Processor C)

■ APPLICATION EXAMPLES

Karaoke system

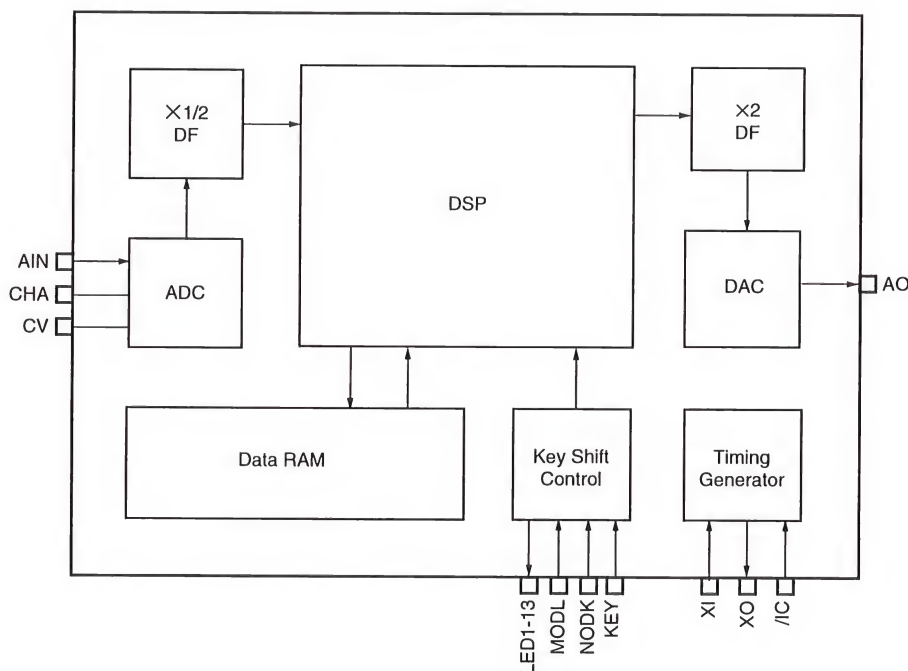
■ OUTLINE

YSS239 is an easy-controlled 1-channel key controller for Karaoke, with LED drive terminals to indicate current key variation.

■ FEATURES

- Key control of -600 cent to $+600$ cent or -400 cent to $+400$ cent in 100 cent steps.
- 13 LED drive terminals for indication of key variation from -600 cent to $+600$ cent by 100 cent.
- Internal signal processing sampling frequency 16kHz.
- Built-in 14-bit floating A/D and D/A converters (32kHz sampling) .
- Built-in RAM.
- Key variation through pulse input by using switches.
- Master clock frequency 768kHz (48fs) .
- 28-pin DIP.

■ BLOCK DIAGRAM



DIGITAL AUDIO

YSS240

KP2S (Karaoke Processor 2 for SRAM)

APPLICATION EXAMPLES

Karaoke system, Video CD player, Video tape recorder

OUTLINE

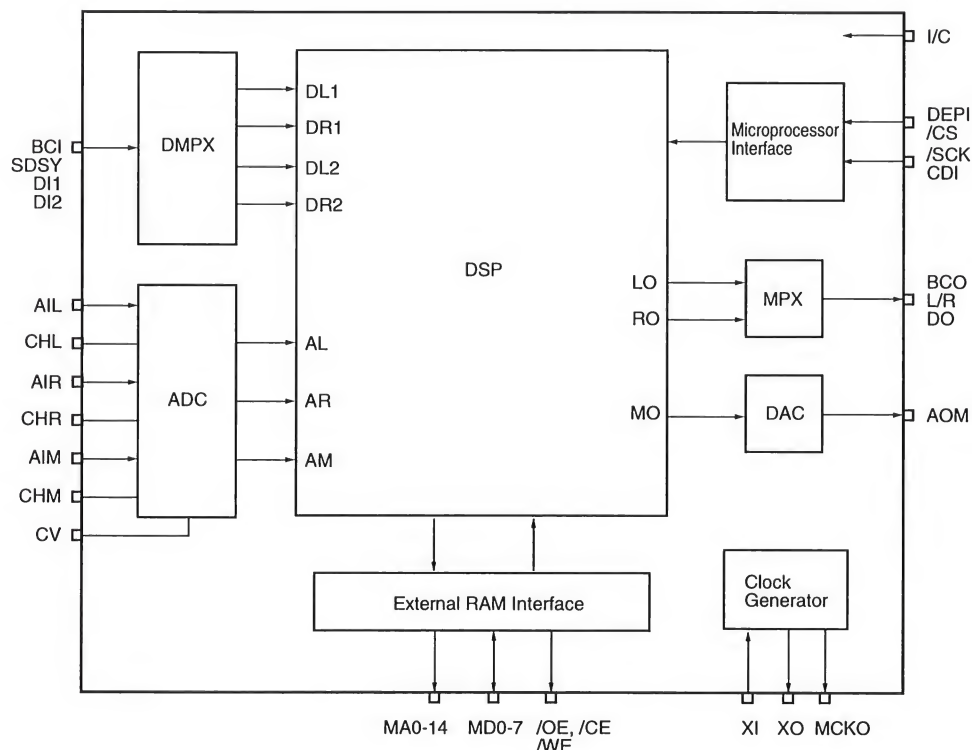
YSS240(KP2S) is a digital signal processor for Karaoke system.

Various signal processing such as key control and microphone echo are performed with an external 256k-bit SRAM or pseudo SRAM.

FEATURES

- Three channels (L,R,MIC) 15-bit floating A/D converter and 1-channel 15-bit floating D/A converter.
- De-emphasis processing for digital input signal.
- Mixing and fade in/out processing for digital/analog signal.
- Serial interface to microprocessor.
- Connecting 256K bit(32Kx8) SRAM or pseudo SRAM enables to realize various sound effects such as;
 - Key-control processing of -600 cent to +600 cent in 50 cent steps,
 - Voice cancel processing for attenuating center-positioned vocal,
 - Microphone echo up to 200ms and
 - Surround signal processing with 4 preset patterns.
- 64-pin QFP.

BLOCK DIAGRAM



DIGITAL AUDIO

YSS244 SCORE (Karaoke Score Processor)

Preliminary

■ APPLICATION EXAMPLES

Karaoke equipment

■ OUTLINE

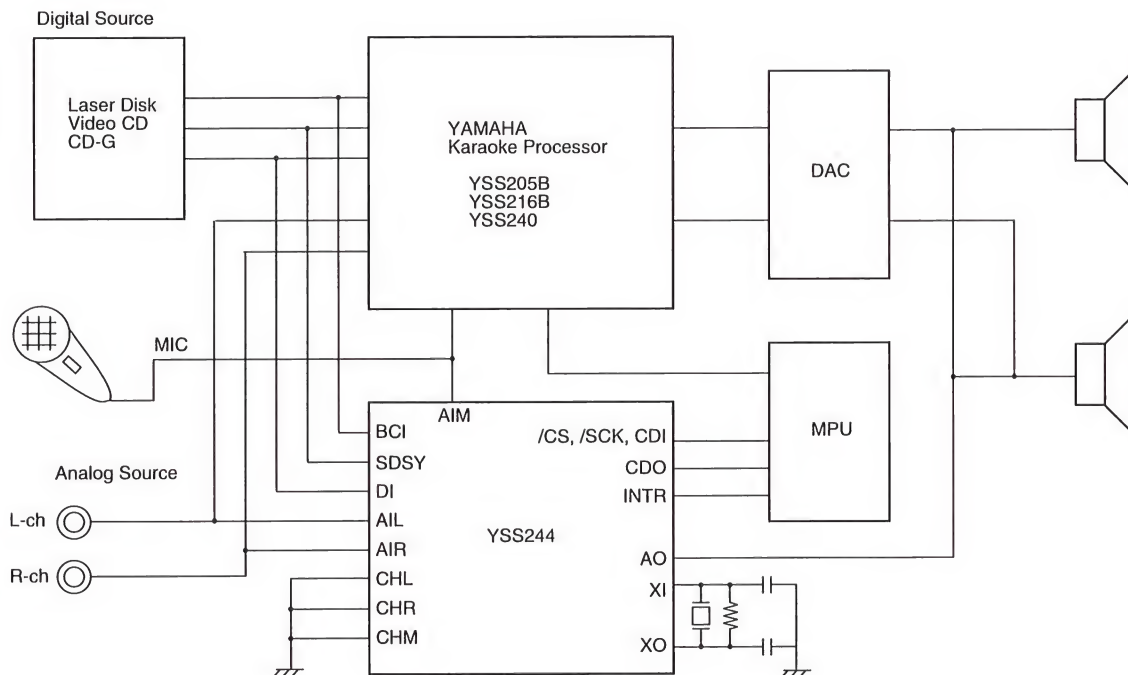
YSS244(SCORE) provides the score of a singer's karaoke performance.

In addition, the internal ADPCM sound generator provides special sounds for karaoke.

■ FEATURES

- Pitch extraction from sample vocal and microphone vocal at the same time with a range of 5-octave.
- Internal ADPCM sound data(192Kbit) provides 15 different sampled sounds for karaoke.
- Two digital-audio input channels and two 8-bit A/D converter channels for sample and microphone vocal input. One channel 12-bit D/A converter for analog output of karaoke sounds.
- 24-pin SOP.

■ SYSTEM BLOCK DIAGRAM



GRAPHICS

YGV615_{RPA3}(Rendering Polygon Accelerator 3)

Preliminary

■ APPLICATION EXAMPLES

3D graphics board for PC, CAD/CAM

■ OUTLINE

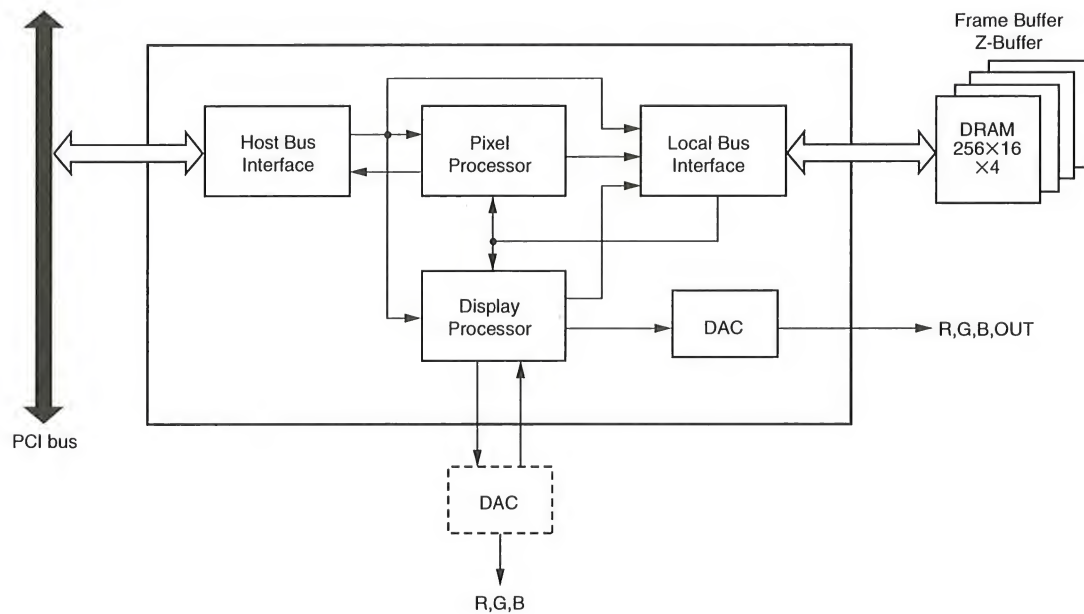
YGV615 is a rendering polygon accelerator to draw the 3D graphics for PC at a high speed. It has an upper compatibility with YGV612(RPA2) while adding new functions.

■ FEATURES

<Additional functions to the YGV612(RPA2).>

- Perspective corrected texture mapping
- α blending
- Linear addressing
- Hardware cursor
- Tri-state memory control signal
- Memory sharing with SVGA chip by REQ/GNT method
- 208-pin SQFP.

■ BLOCK DIAGRAM



GRAPHICS

YGV612

RPA2(Rendering Polygon Accelerator 2)

■ APPLICATION EXAMPLES

PC-Game, CAD/CAM.

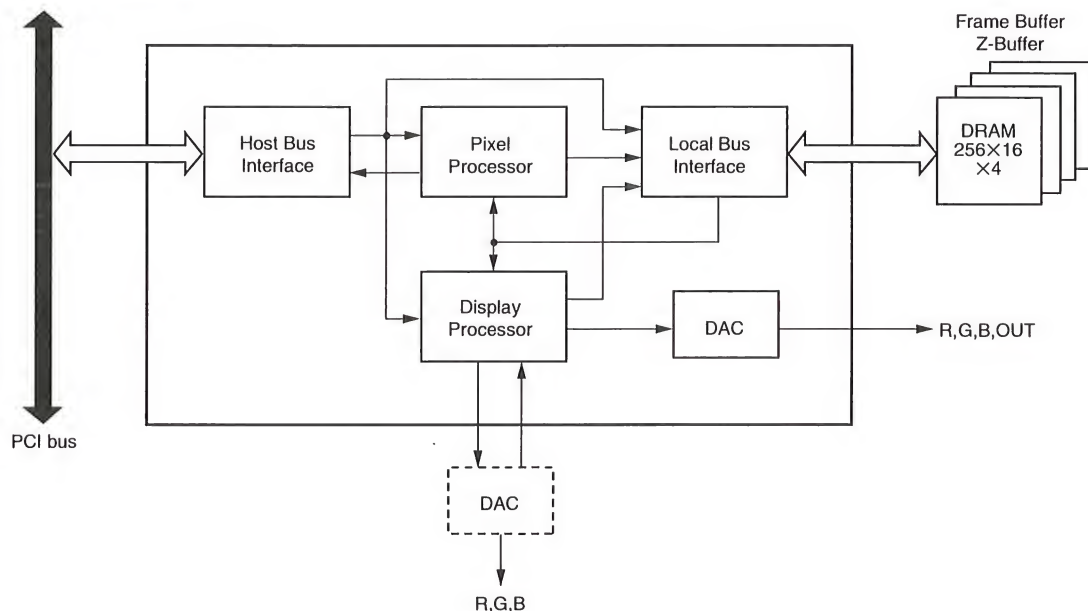
■ OUTLINE

YGV612 is a rendering polygon accelerator with full texture mapping functions in hardware. Along with the powerful Application Program Interface drivers, high-quality real-time 2D/3D graphics are possible on PCs for CAD/CAM, games and business applications.

■ FEATURES

- Local-Buffer-Memory shared by Frame-Buffer, Texture-cache, Z-buffer.
→ 2/4M-byte (256K*16 by 4/8-packages) & XY-addressing memory configuration (1024/2048*1024*16).
- Z-buffering capability of 16-bit depth.
- Resolution & Color: programmable register → typical memory configurations are, 640*480 double buffer, 16-bit color, 384*1024 remained for texture cache 1024*768 single buffer, 16-bit color.
- 64-bit Local Buffer Interface & Host-PCI-Interface with 16*32bit word FIFO buffer. Glueless PCI-bus Interface & VL-bus Interface with 8TTL-packages.
- Integrated video DAC up to 30MHz.
- 16-bit RAMDAC interface up to 85MHz.
- BitBlt operation of 6.6Million 16-bit-pixel/sec & Line drawing of 900K 10-pixel/sec.
- Rendering Performance for a polygon of 3D-50pixel-triangle:
 - 300 K poly/sec for Gouraud Shading.
 - 100 K poly/sec for Gouraud Shading & Z-Buffering.
 - 150 K poly/sec for Texture Mapping.
 - 70 K poly/sec for Texture Mapping & Z-Buffering.
- Application Program Interface (API) drivers available.
- 208-pin SQFP.

■ BLOCK DIAGRAM



GRAPHICS

YGV604 VSG (Video Screen Generator)

APPLICATION EXAMPLES

Video titler, On-screen display equipment, Educational toy.

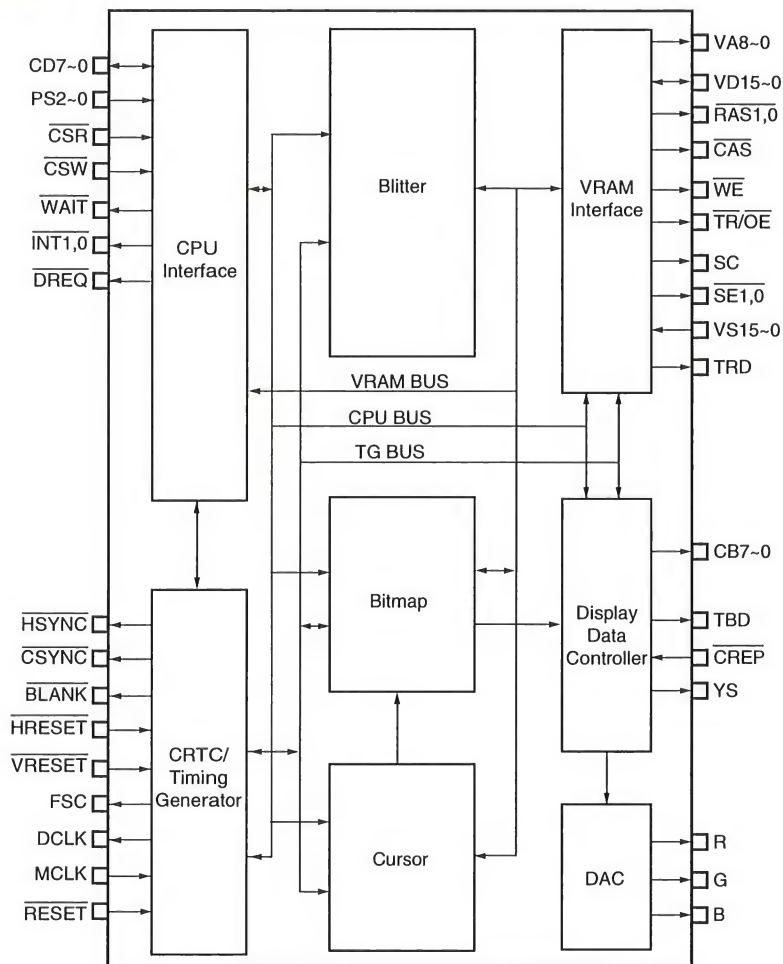
OUTLINE

YGV604 is a video display processor for TV screens, with high level display and high speed drawing functions.

FEATURES

- Display resolution NTSC : 384×240 (480) , 768×240 (480)
PAL : 384×290 (580) , 768×290 (580)
() ... for interlace display
- Displays maximum 32768 colors simultaneously.
- Omni-directional smooth scroll.
- Maximum cursor size 32×32 dots, 16 out of 32768 colors.
- Linear RGB output by built-in DAC.
- Various kinds of graphic drawing functions and logical operations.
- Maximum 105 nsec/dot drawing speed.
- Dual port RAM ($64k \times 4$, $128k \times 8$, $256k \times 4$) up to 1MB for VRAM.
- 8-bit parallel bus CPU interface.
- 100-pin QFP.

BLOCK DIAGRAM



GRAPHICS

YGV614

PVDC3 (Pattern mode Video Display Controller 3)

Preliminary

APPLICATION EXAMPLES

Arcade game machine

OUTLINE

YGV614 is a video display controller LSI with 4 pattern graphic planes and 96 sprite planes.

FEATURES

<Pattern graphic plane>

- Maximum 4 screens simultaneous display.
- Maximum display size of 4096 x 4096 dots.
- Built-in color palette of 1024 out of 260,000 colors.
- Color space conversion function
- Scroll, parameter for zooming, rotation, α blending level, shading level are controllable for each line.

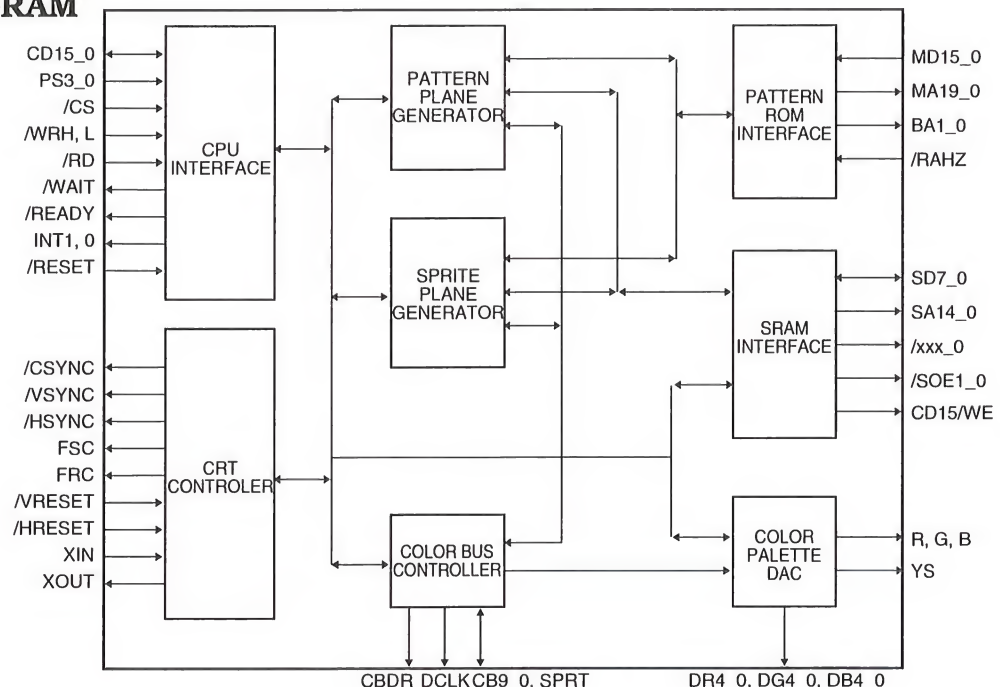
<Sprite plane>

- Selectable size from 8, 16, 32, 64 dots independent for both horizontally and vertically.
- Selectable 65,536 display patterns for each sprite independently.
- Both zooming and compression can be independently controlled both horizontally and vertically.
- Display position, zooming and compression parameter, α blending level, shading level can be controlled for each line.

<Peripheral interface specifications>

- Asynchronous I/O interface with CPU by 16-bit or 8-bit.
- Display resolution, monitor synchronous frequency can be set with parameter.
- Both analog and digital RGB output.
- External synchronize function enables connection with other VDPs.
- 160-pin QFP.

BLOCK DIAGRAM



GRAPHICS

YGV608 PVDC2 (Pattern mode Video Display Controller 2)

■ APPLICATION EXAMPLES

Arcade game machine

■ OUTLINE

YGV608 is a pattern mode video display processor with 2 pattern graphic planes and 64 sprite planes suitable for controlling various display screens.

■ FEATURES

<Pattern graphic plane>

- Two screens with the maximum size of 4096 x 4096 dots can be constructed simultaneously.
- Two 64 x 32 pattern (1 page) pattern name table RAMs are built in.
- Divided screen can be scrolled in pattern units.
- Built-in 16 color palettes with 16 out of 260,000 colors enables to display 256 colors.
- External pattern generator ROM can be connected up to maximum 2Mbytes.
- Zoom compression and rotation display functions.

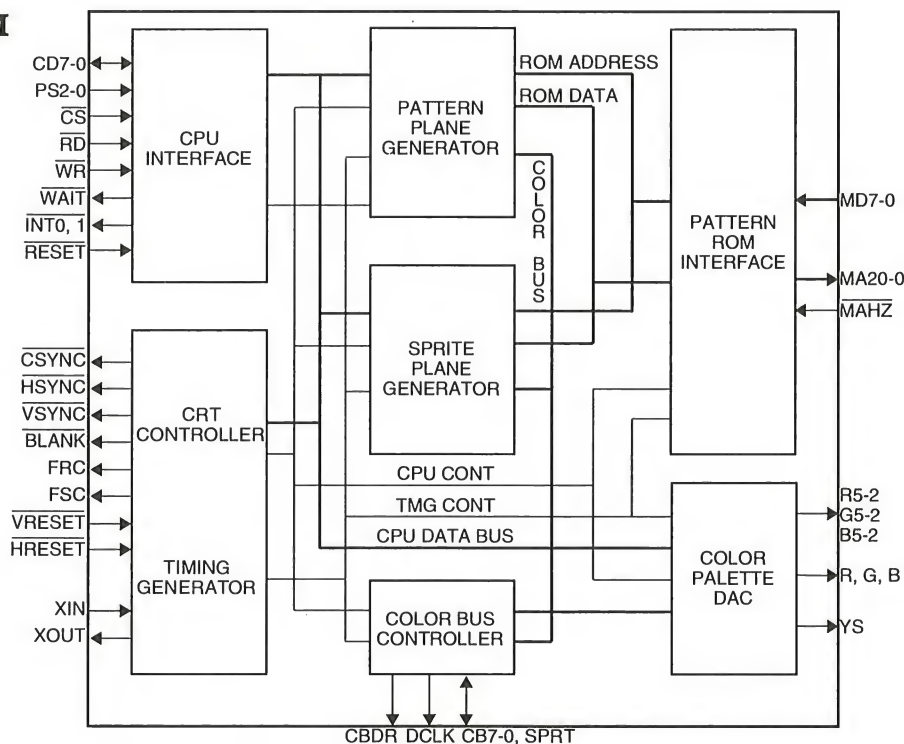
<Sprite plane>

- Built-in sprite attributes table RAM.
- Maximum number of sprites that can be displayed on one screen is 64, with a maximum of 16 sprites on one horizontal line.
- The size of each sprite can be selected from among 8x8, 16x16, 32x32, and 64x64 dots.

<Others>

- Monitor synchronization frequency, for clock frequency(maximum 8MHz), display screen resolution, etc. can be set as parameters.
- Linear RGB output by built-in DAC.
- Multiple VDPs structure is easy through the display color code input/output terminal.
- 100-pin QFP.

■ BLOCK DIAGRAM



GRAPHICS

YGV605_{PVDC} (Pattern mode Video Display Controller)

■ APPLICATION EXAMPLES

Amusement game machine.

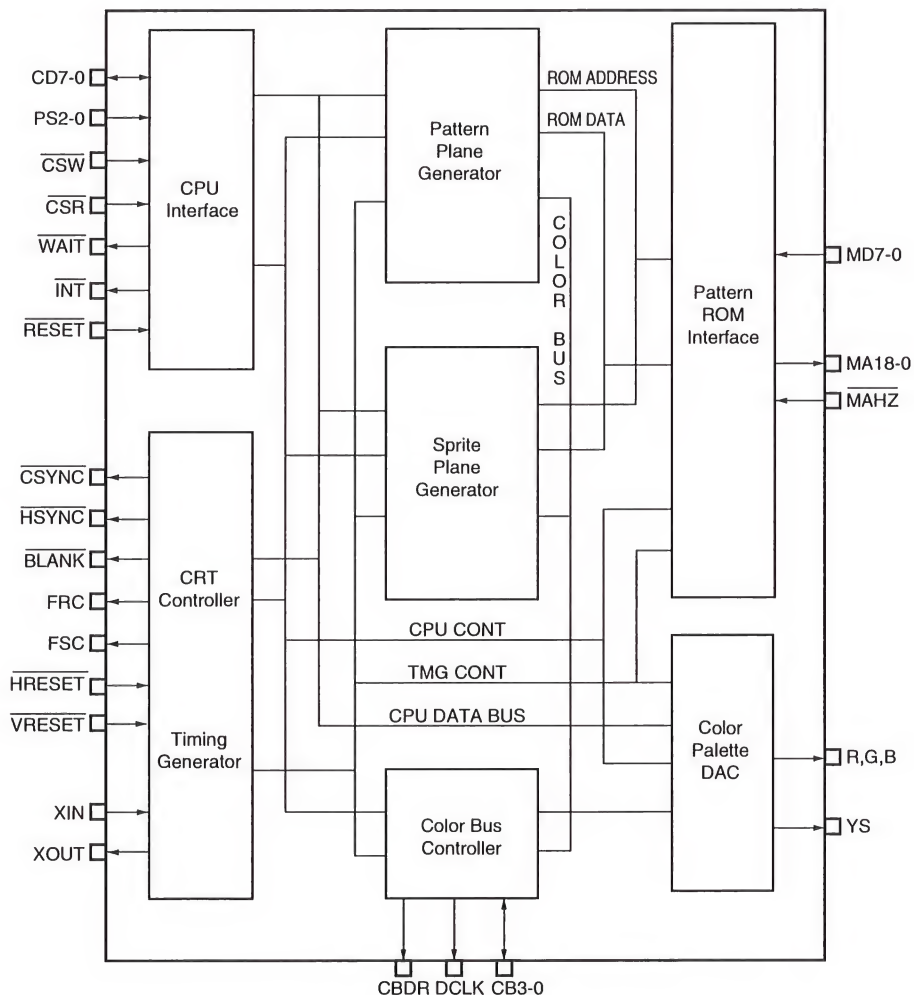
■ OUTLINE

YGV605 is a pattern mode video display processor for TVs, CRT monitors and LCD panels.

■ FEATURES

- Consists of 1 pattern graphic plane (scroll screen) and 64 sprite planes (movable screens) .
- Since VRAM is built-in, only a pattern ROM is needed for an external video memory.
- Individual scrolling on a divided screen.
- 16 out of 4096 colors selectable from built-in color palette.
- Up to 64 sprites, maximum 16 on one horizontal line.
- 80-pin QFP.

■ BLOCK DIAGRAM



GRAPHICS

YGV606B AVDP (Advanced Video Display Processor)

■ APPLICATION EXAMPLES

Karaoke equipment, On-screen display equipment.

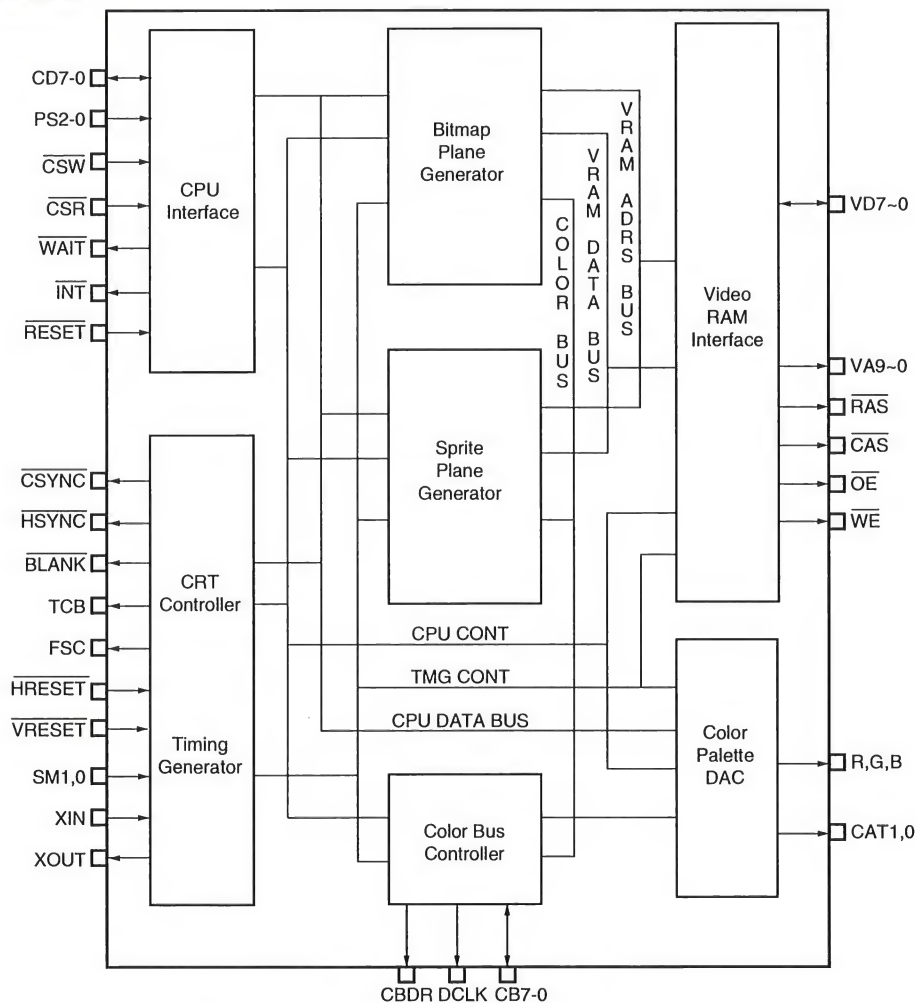
■ OUTLINE

YGV606B is a video display processor for TV screens with high level display and drawing functions.

■ FEATURES

- Display resolution NTSC : 368×240 (480)
PAL : 368×280 (560)
()....for interlace display
- Built-in color palette.
- Displays 16 out of 256 colors simultaneously.
- Omni-directional scroll.
- Displays two 32×32 dot sprites.
- Linear RGB output through built-in DAC.
- 1M ($256k \times 4$) or 4M ($1M \times 4$, $512k \times 8$) DRAM can be used as VRAM.
- 8-bit parallel CPU interface.
- 80-pin QFP.

■ BLOCK DIAGRAM



GRAPHICS

YGV610B CPDC (Color Panel Display Controller)

■ APPLICATION EXAMPLES

Copier, Fax machine, Measurement equipment

■ OUTLINE

YGV610B is a color panel display controller for STN LCD displays.

Up to simultaneous 256 colors on a color STN LCD, and up to 15 gray-scales on a monochrome LCD can be displayed.

■ FEATURES

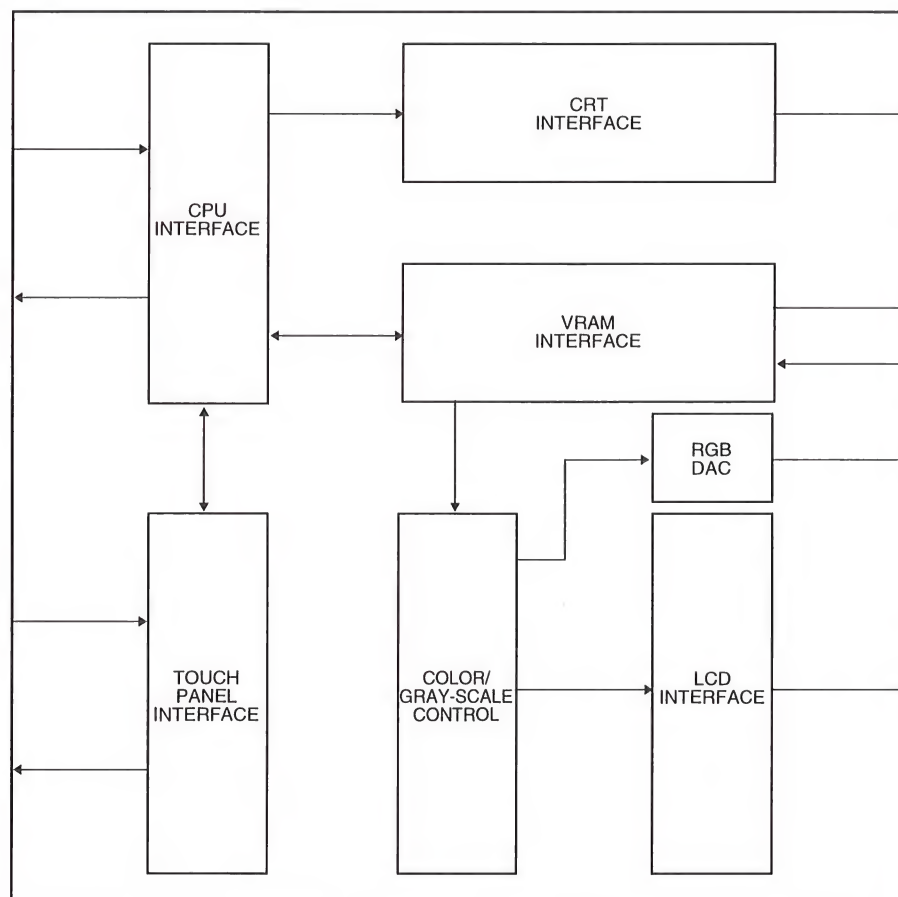
<Display functions>

- One-screen color and monochrome STN panels from 128 x 128 to 640 x 240.
- Two screen monochrome STN panel up to 640 x 480.
- Four out of 16 colors from among 512 colors can be displayed by built-in color lookup table.

<Other functions>

- Built-in touch panel interface.
- Supports 1-screen monochrome LCD panel, 2-screen monochrome LCD panel, and 1-screen color LCD panel.
- 4/8-bit bus configuration DRAM can be used.
- Built-in DAC with 3-bit R,G, and B inputs. CRT output is also supported.
- 100-pin QFP.

■ BLOCK DIAGRAM



GRAPHICS

YGV613

NVDP (Navigation System VDP)

Preliminary

■ APPLICATION EXAMPLES

Car navigation system, Karaoke system

■ OUTLINE

YGV613(NVDP) is a video display processor for automobile navigation systems.

■ FEATURES

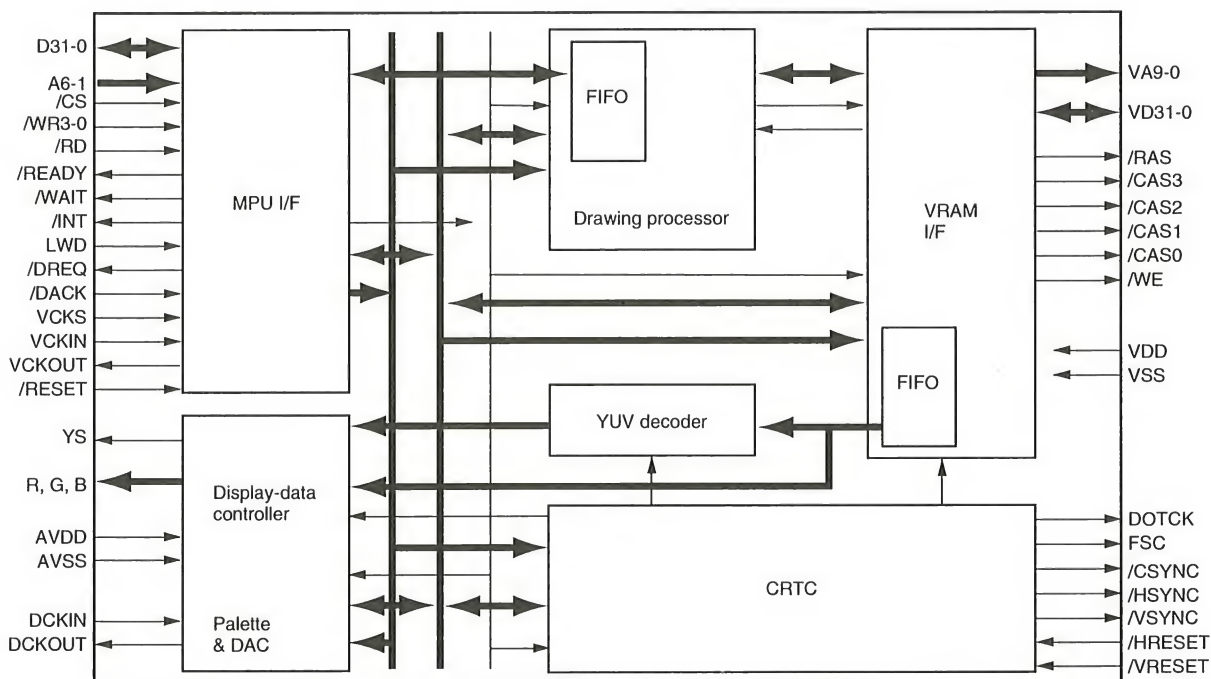
<Display structures>

- Up to three bitmapped layers(each with 16 simultaneous colors).
- Two of the three 16-color layers can be replaced with one 256-color bitmapped layer.
- Built-in pattern RAM supporting two 16-color, 32×32 dot sprite displays.
- Each sprite display can be set to cross hairs cursor.

<Display functions>

- Monitor-sync frequency, dot-clock frequency, and display resolution can be set as parameters.
- α blending
- Built in 256-word by 19-bit CLUT(6bits each for R,G, B, and 1 YS bit) allowing the selection form among 260,000 colors.
- Linear RGB output(built-in DAC with RGB 8-bit each).
- External sync function.
- High speed drawing with 8 kinds of drawing commands.
- 144-pin SQFP.

■ BLOCK DIAGRAM



GRAPHICS

V9990 E-VDP-III (Enhanced Video Display Processor 3)

■ APPLICATION EXAMPLES

Video game, Karaoke system, Car navigation system.

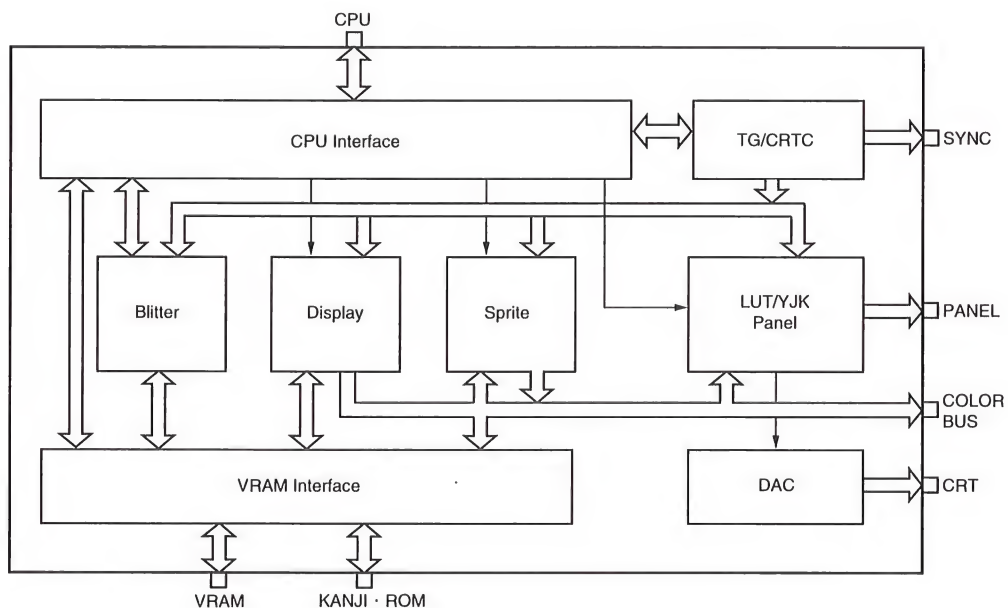
■ OUTLINE

V9990 is a video display processor with high-speed drawing and animation functions. V9990 provides various screen modes for games, audio & video and office use, supporting many types of displays such as TVs, CRT monitors and LCD panels.

■ FEATURES

- 3 display modes.
 - Pattern display mode ($256 \times 212 \times 2$ screens, 512×212)
 - NTSC or PAL monitor mode (256×212 , 384×240 , 512×212 , 768×240)
 - High-resolution monitor mode (640×400 , 640×480)
- Built-in color palette. (64 colors selected out of 32768 colors) (16 colors/dot out of 32768 colors when displayed on a high-resolution monitor)
- Omni-directional smooth scrolling.
- Superimposition and digitization.
- High-speed hardware drawing commands.
- Hardware cursor display function.
- External dual port DRAM ($64k \times 4$, $128k \times 8$, $256k \times 4$) for VRAM.
- Character generator ROM connectable.
- 128-pin QFP.

■ BLOCK DIAGRAM



GRAPHICS

V9958 E-VDP-II (Enhanced Video Display Processor 2)

■ APPLICATION EXAMPLES

Video painter toy, Video titler, Caption machine.

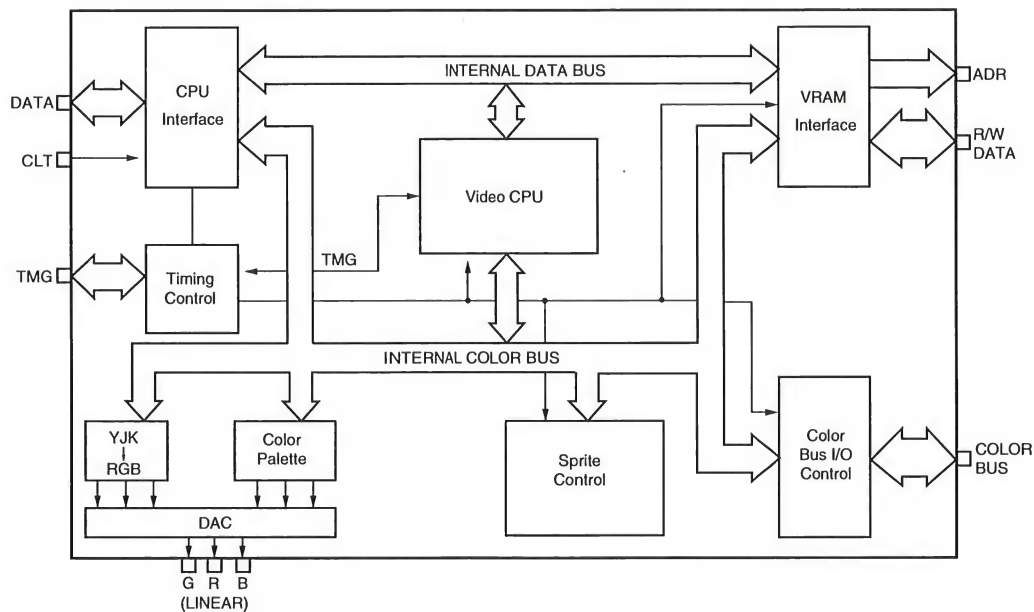
■ OUTLINE

V9958 is a video display processor upper compatible with TMS9918A and V9938.

■ FEATURES

- Linear RGB output.
- Maximum 256 colors display by built-in color palette.
- Maximum 128k byte for display memory.
- Auto refresh function.
- Various commands and logical operations.
- Superimpose function.
- Omni-directional smooth scroll function.
- External DRAM (16k×1, 16k×4, 64k×1, 64k×4).
- 64-pin SDIP.

■ BLOCK DIAGRAM



GRAPHICS

V6366C PCDC (Panel Display & CRT Display Controller)

■ APPLICATION EXAMPLES

Laptop computer, Notebook computer.

■ OUTLINE

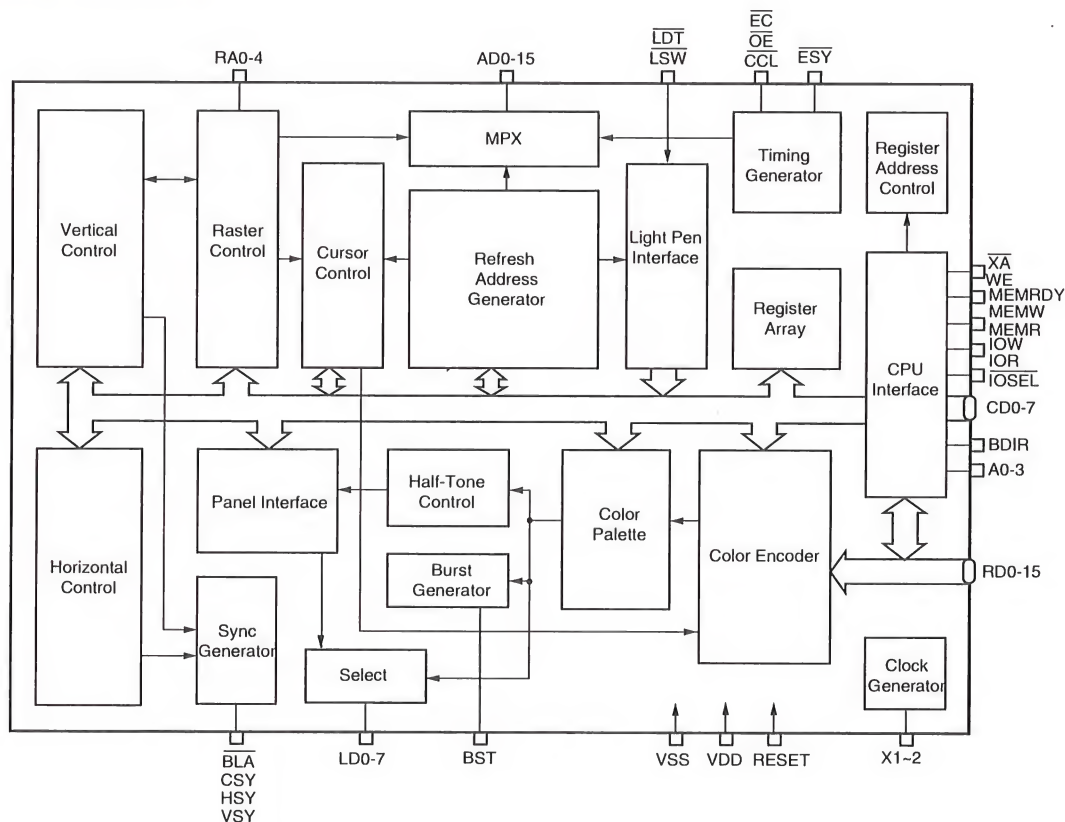
V6366C is a display controller, supporting CRT and various types of flat panels.

V6366C is compatible with the CGA (Color Graphics Adapter) , MDA (Monochrome Display Adapter) and HGC (Hercules Graphics Card) .

■ FEATURES

- MC6845 function is built in.
- Supports 640×400 and 720×350 panels.
- CRT, LCD, EL and Plasma Display can be connected.
- Gray-scaling/hatching display for panels or a monochrome monitor.
- Either SRAM or DRAM can be used as VRAM.
- Light pen interface.
- Standby mode.
- Kanji display capability of 16×16 , 24×24 or 32×32 pixels.
- Simultaneous display capability with a PC monitor and a one-screen LCD of 640×200 .
- 100-pin QFP, 84-pin PLCC.

■ BLOCK DIAGRAM



COMMUNICATION

YM7405B^{IDNDCH}

(ISDN basic access controller with D channel packet)

■ APPLICATION EXAMPLES

ISDN terminal equipment (TE) , PBX (NT2) .

■ OUTLINE

YM7405B is an ISDN user-network interface LSI, supporting Layer 1 (physical layer) and Layer 2 (LAP-D protocol) in one chip. YM7405B also supports D channel packet mode.

■ FEATURES

<Layer 1.>

- Compatible with ITU-T Recommendation I. 430[1992 edition], TTC Standard JT-I430[1993 edition] and ETSI ETS 300 012 [Apr. 1992].
- Interface structure: 2B+D (B=64kbps, D=16kbps).
- Built-in analog driver and receiver.

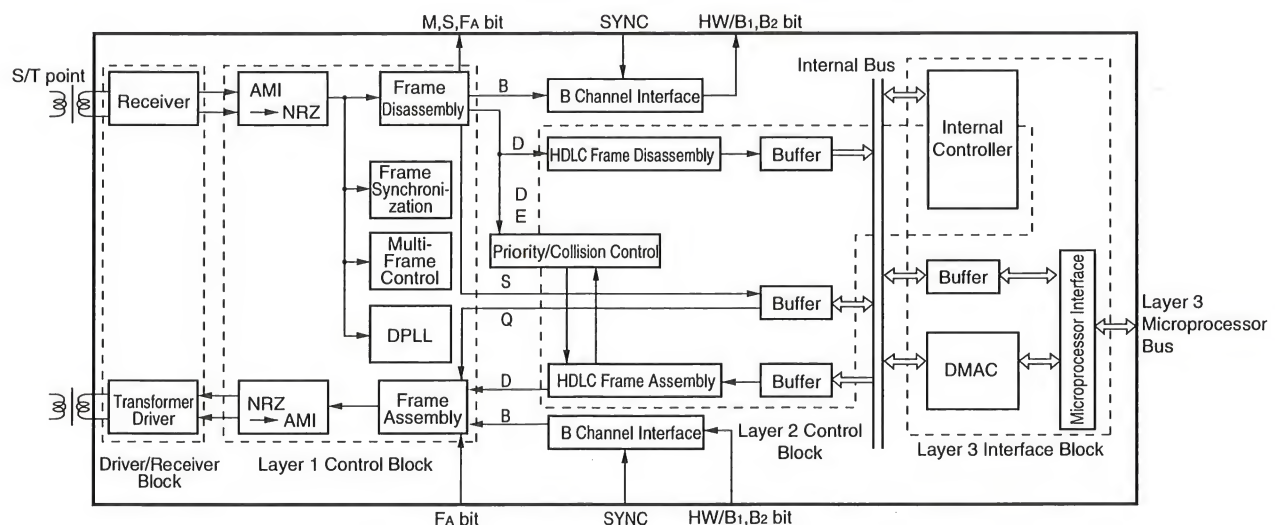
<Layer 2.>

- Compatible with ITU-T Recommendation Q.920 and Q.921 [1992 edition], TTC Standard JT-Q920/JT-Q921 [1993 edition] and ETSI ETS 300 125 [Sep. 1991].
- LAP-D status control (sequence control, flow control, SAPI control).
- Automatic assigned TEI/non-automatic assigned TEI (VC/PVC) capability.

<Others>

- Layer 3 interface to 8-bit or 16-bit microprocessor (8086 family, Z80 family, 6800 family and 68000 family) .
- Power-down mode.
- 80-pin QFP, 100-pin TQFP.

■ BLOCK DIAGRAM



COMMUNICATION

YTD410^{IDNTEL}

(ISDN basic access controller with D channel packet)

■ APPLICATION EXAMPLES

ISDN terminal equipment (TE).

■ OUTLINE

YTD410 is a low-power ISDN user-network interface LSI, supporting Layer 1 (physical layer) and Layer 2 (LAP-D protocol) in one chip. Its host processor drive clock enables a large reduction of the total power consumption of Terminal Equipments.

■ FEATURES

<Layer 1.>

- Compatible with ITU-T Recommendation I. 430[1992 edition], TTC Standard JT-I430[1993 edition].
- Interface structure: 2B+D (B=64kbps, D=16kbps)
- 56kbps B channel interface.
- Built-in analog driver and receiver.

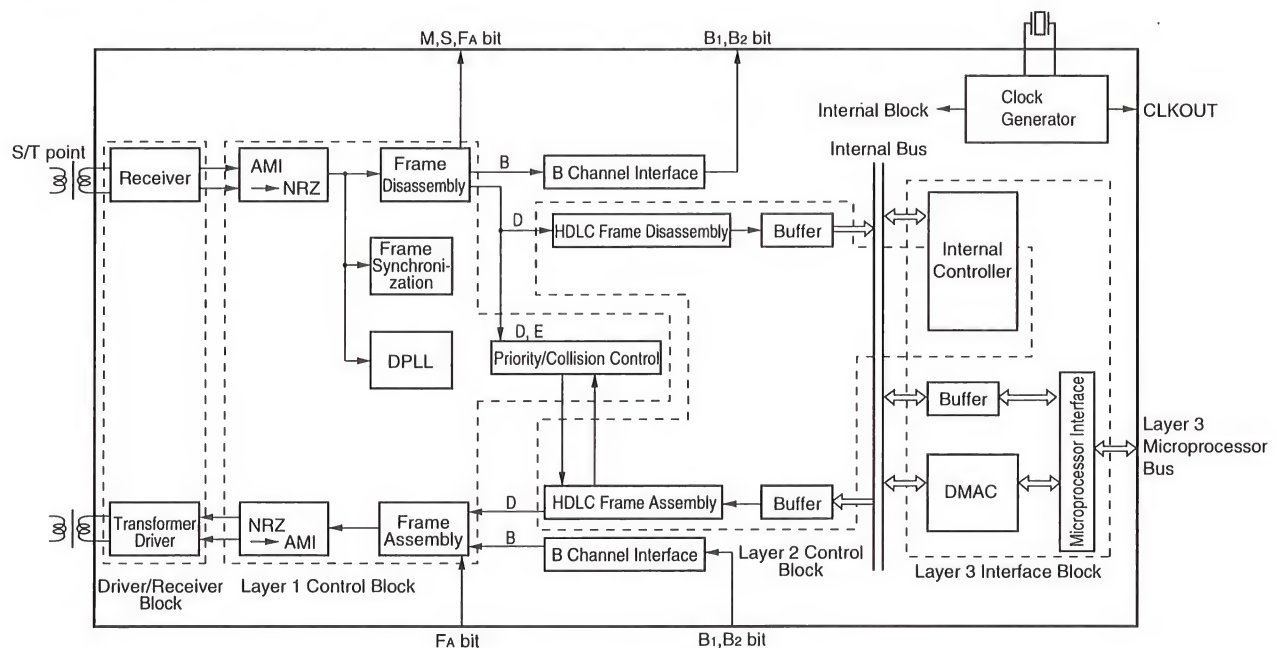
<Layer 2.>

- Compatible with ITU-T Recommendation Q.920 and Q.921[1992 edition], TTC Standard JT-Q920 and JT-Q921[1993 edition].
- LAP-D status control (sequence control, flow control, SAPI control).
- Automatic assigned TEI/non-automatic assigned TEI (VC/PVC) capability.

<Others>

- Layer 3 interface to 8-bit or 16-bit microprocessor (8086 family, Z80 family, 6800 family and 68000 family).
- Low power consumption: Typ.65mW in normal mode and Typ.2mW in power-down mode.
- Clock output to drive host processor.
- 80-pin QFP, 100-pin TQFP.

■ BLOCK DIAGRAM



COMMUNICATION

YTD418 IDNPHS

(ISDN basic access controller for PHS Base Station)

■ APPLICATION EXAMPLES

PHS Base Station, TA

■ OUTLINE

YTD418 is an ISDN user-network interface LSI, supporting Layer 1 (physical layer) and Layer 2 (LAP-D protocol) in one chip. The YTD418 can be connected directly to DSU which has TTL interface.

■ FEATURES

<Layer 1.>

- Compatible with ITU-T Recommendation I.430[1992 edition] and TTC Standard JT-I430[1993 edition].
- Interface structure: 2B+D (B=64kbps, D=16kbps).

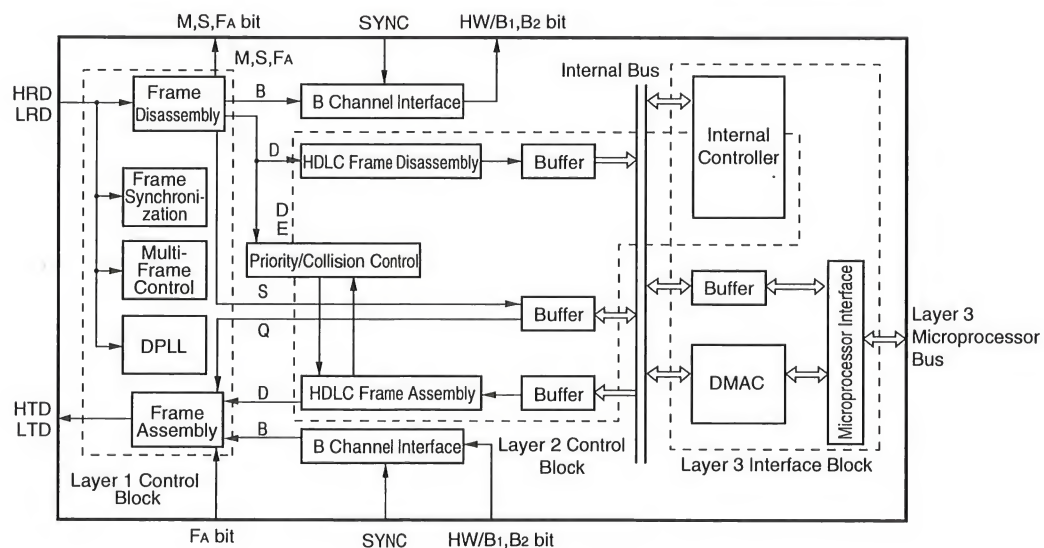
<Layer 2.>

- Compatible with ITU-T Recommendation Q.920 and Q.921[1992 edition], TTC Standard JT-Q920 and JT-Q921 [1993 edition].
- LAP-D status control (sequence control, flow control, SAPI control).
- Automatic assigned TEI/non-automatic assigned TEI (VC/PVC) capability.

<Others>

- Layer 3 interface to 8-bit or 16-bit microprocessor (8086 family, Z80 family, 6800 family and 68000 family) .
- Power-down mode.
- 80-pin QFP.

■ BLOCK DIAGRAM



COMMUNICATION

YTD402 TA110 (Terminal Adaptor according to V.110, X.30)

APPLICATION EXAMPLES

ISDN terminal adaptor.

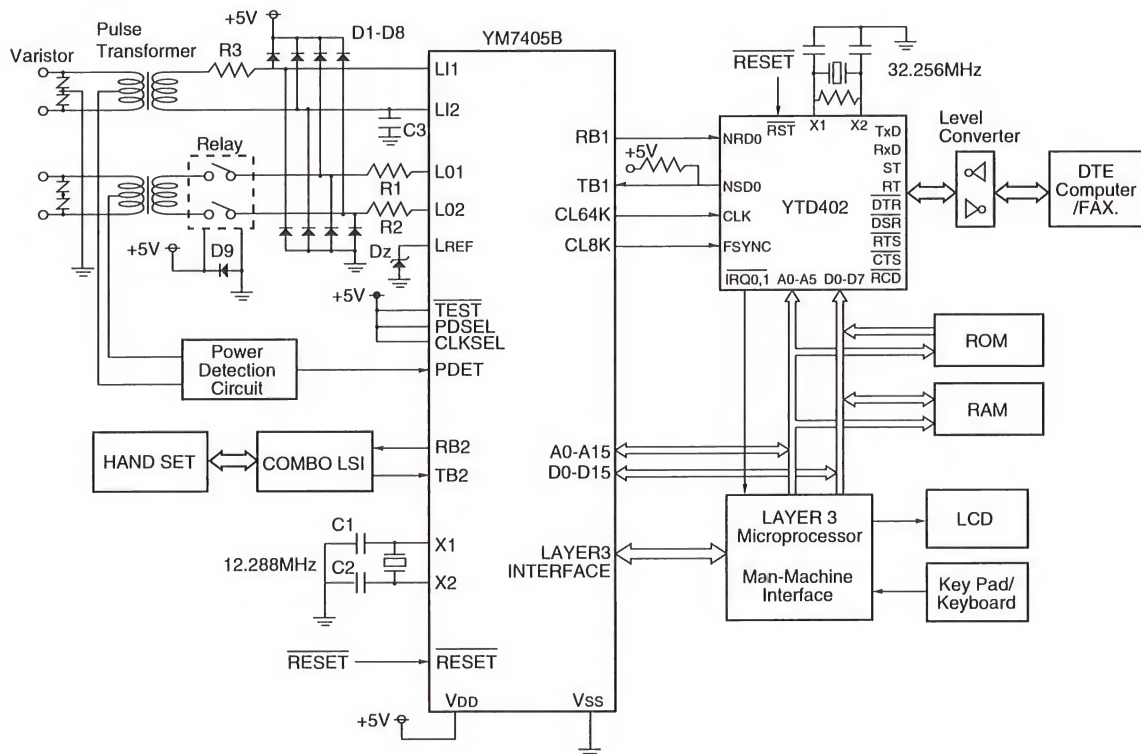
OUTLINE

YTD402 is a rate adaption LSI for ISDN terminal adaptor conforming to ITU-T V.110 or X.30. YTD402 can be directly connected with YM7405B.

FEATURES

- Bit rate adaption conforming to ITU-T Recommendations V.110 and X.30 (1988 edition).
- Synchronous 600, 1200, 2400, 4800, 7200, 9600, 14.4k, 19.2k, 48k, 56k and 64kbps.
- Asynchronous 50, 75, 110, 150, 200, 300, 600, 1200, 2400, 3600, 4800, 7200, 9600, 14.4k, 19.2kbps.
- V.24 and X.21 interfaces.
- AT command, X.21 and V.25 bis calling procedure support.
- Stand-by mode.
- 44-pin QFP.

SYSTEM BLOCK DIAGRAM



COMMUNICATION

YTM411B MD9624LV (3.3V Fax-Data-Voice Modem)

■ APPLICATION EXAMPLES

PC fax/data/voice card, PCMCIA modem card.

■ OUTLINE

YTM411B is a single-chip fax/data/voice LSI offering extended voice functions and low power consumption operated in 3.3/5V.

■ FEATURES

- Communication compatibility.
 - ITU-T V.29, V.27ter, V.26bis, V.23, V.22bis, V.22 (A/B) , V.21.
 - Bell 212A, 202, 103.
- Communication speed.
 - Synchronous half-duplex communication : 9600/7200/4800/2400/1200/300bps.
 - Asynchronous full-duplex communication : 2400/1200/600/300bps.
 - Modified full-duplex communication : 4800 (75) /2400 (75) /1200 (75) bps.
- Voice recording and reproduction

Sampling frequency: 11025/9600/8000/7200 Hz

16-bit (Max.) PCM, 3/4 bit ADPCM, A-Law, μ -Law

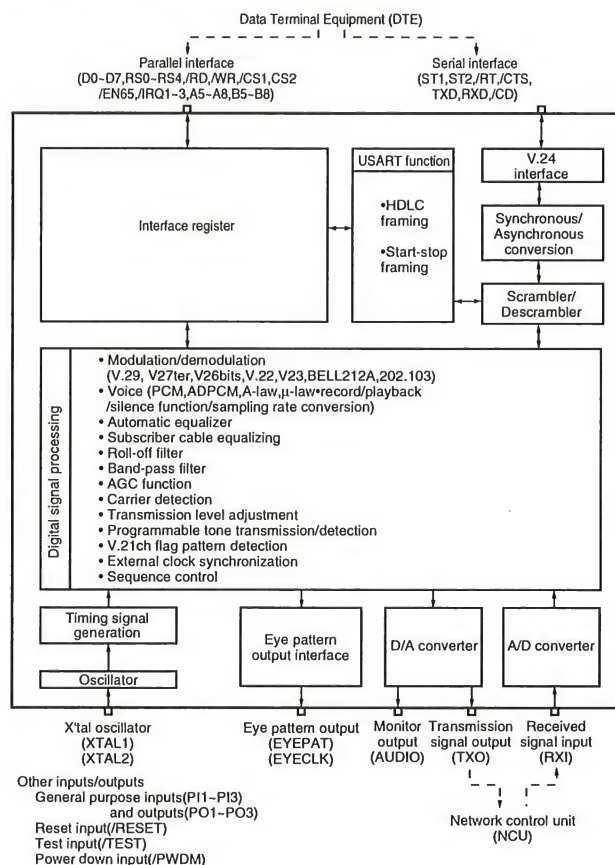
Silence detection, compression and insertion
- Built-in handshake sequencer:

V.22bis/V.22/212A.
- DTE interface in serial (V.24) , parallel (microprocessor bus) , and USART function (HDLC framing, start-stop framing) .
- Programmable tone generating and detection for guard/call progress/DTMF tones.
- Reception dynamic range :
 - 4~50dBm. (3.3V) ,
 - 0~50dBm. (5V)
- Carrier detection level control.
- Sending level control :
 - 10~-∞dBm. (3.3V) ,
 - 6~-∞dBm. (5V)
- Clock 19.6608MHz.
- General purpose I/O port for NCU control.
- Low power consumption:

Typ.30mA (operation) , 80 μ A (power-save) , 5 μ A (power-down) at 3.3V

Typ.60mA (operation) , 200 μ A (power-save) , 5 μ A (power-down) at 5V
- 64-pin QFP, 64-pin TQFP.

■ BLOCK DIAGRAM



COMMUNICATION

YTM401 MD96DX (9600 bps Fax Modem with HDLC)

■ APPLICATION EXAMPLES

G3 facsimile, PC fax card.

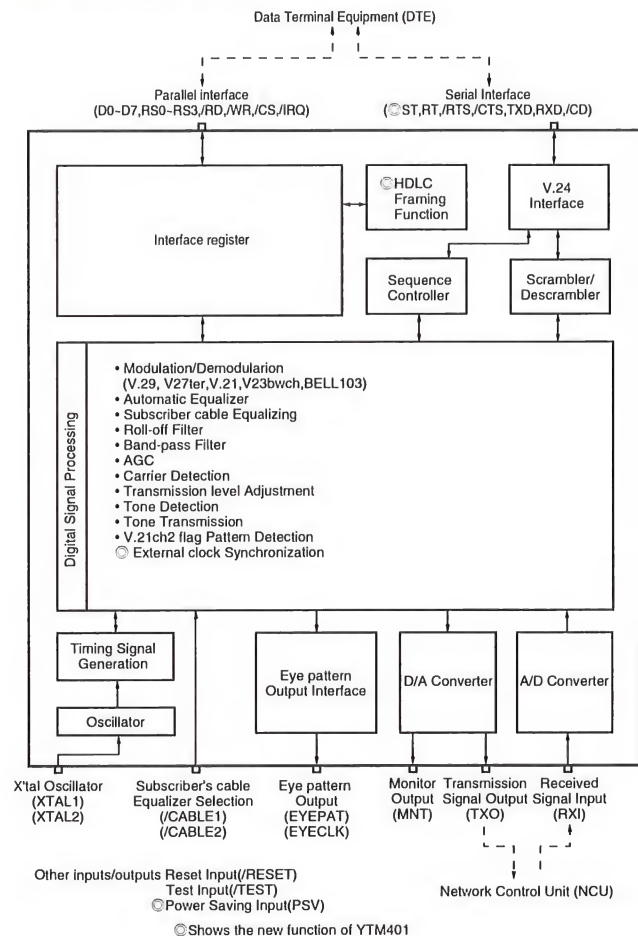
■ OUTLINE

YTM401 is a single-chip modem LSI with HDLC function for G3 facsimiles. Thanks to its low power consumption and power-save mode, YTM401 is best suited for portable facsimiles and notebook/pocket PC faxes.

■ FEATURES

- CCITT V.29 (9600/7200 bps) Half-duplex, synchronous.
- V.27ter (4800/2400 bps) Half-duplex, synchronous.
- V.21ch2 (300 bps) Half-duplex, synchronous.
- V.23 backward ch (75 bps) Transmission only.
- V.21 (300 bps) Full-duplex.
- BELL 103 (300 bps) Full-duplex.
- Compatible with public switched telephone network (two-wire).
- Dual-tone generation (programmable).
- Tone detection (programmable), DTMF detection (programmable).
- Transmission level : 0~-15 dBm (programmable)
- Reception dynamic range : 0~-43 dBm (programmable)
- Incorporated HDLC framing function for ECM mode.
- General purpose input/output terminals (when serial interface is not used) .
- External clock synchronization function.
- Power saving mode by hardware (Typ.5 μ A) or by software (Typ. 200 μ A)
- 40-pin DIP, 64-pin QFP, 44-pin TQFP.

■ BLOCK DIAGRAM



COMMUNICATION

YTZ420 FCC (Fieldbus Communication Controller)

APPLICATION EXAMPLES

Flow controller, Temperature controller, Field transmitter

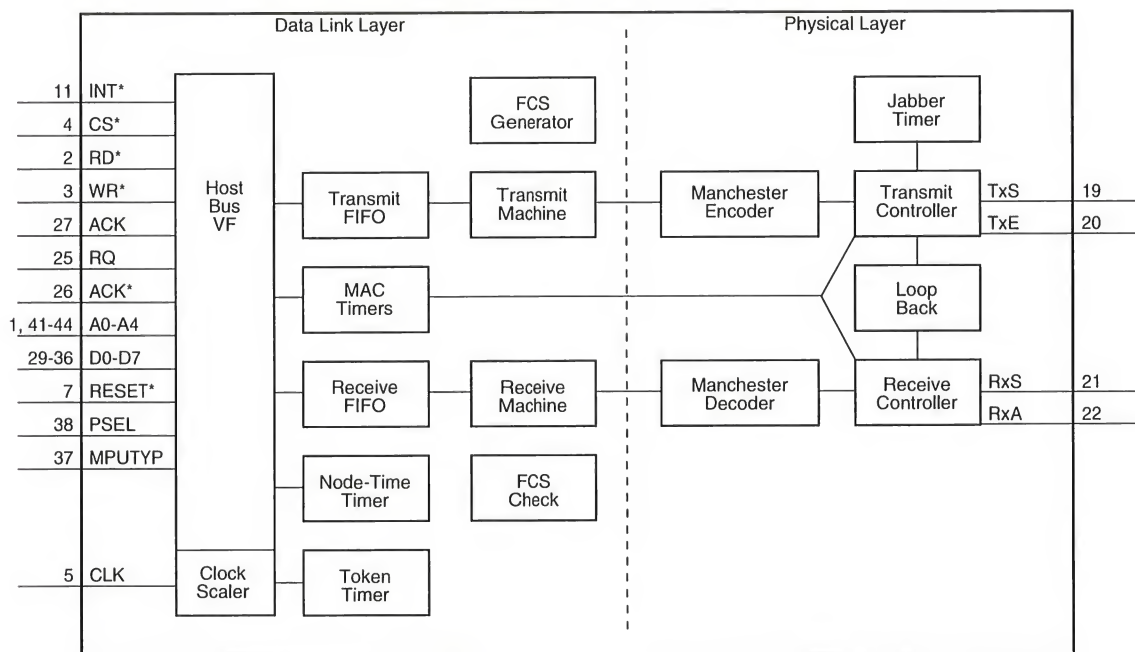
OUTLINE

YTZ420(FCC) is a communication controller LSI intended for use in a node of fieldbus operating per International standard, IEC1158.

FEATURES

- Low power consumption: less than 3mW.
- Wide voltage range: 3 to 5V.
- 100% compatible to IEC 1158-2.
- Data rate: 31.25kbps and 1Mbps.
- Two useful signal driving methods including standard MDA-MAU interface.
- Internal and external loop back capability for self diagnostics.
- DL-timer (Node time and Token hold time)
- 44-pin QFP.

BLOCK DIAGRAM



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